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PART I. April, 1837.

# THE
# CYCLOPÆDIA
# OF
# PRACTICAL SURGERY,

COMPRISING A SERIES OF

ORIGINAL DISSERTATIONS ON OPERATIVE MEDICINE,

BY AN ASSOCIATION OF PHYSICIANS AND SURGEONS.

EDITED BY

**WILLIAM B. COSTELLO, M.D.,**

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This work has been undertaken for the purpose of collecting into one copious and comprehensive Digest, the doctrines of Surgery, which are now scattered in numberless volumes, and the valuable views of practice, which either rest on individual experience, or are inculcated in too isolated a manner for the general benefit. The inducements to such an undertaking are numerous and encouraging. Already has the therapeutical department of the healing art received an able exposition, from the union of industry and talent to which the "Cyclopædia of Practical Medicine" owes its birth. Surgery ought to keep pace with its sister science. The progress of surgical improvement has, of late years, been so rapid and extensive, and some of its long-established processes have been so remodelled or totally changed, that a work in which the entire body of surgical doctrine and practice shall be collated, and raised to the level of the present time, is imperatively demanded.

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Gilbert and Rivington, Printers, St. John's Square, London.

38, Bruton Street, Berkeley Square,
*25th March*, 1837.

In publishing the First Number of the "Cyclopædia of Practical Surgery," a word of explanation is due to those who, feeling an interest in the success of the Work, have remonstrated against the delay that has occurred in issuing it, and which was in some degree unavoidable. It would, doubtless, have been a matter of little difficulty to unite such a number of writers, as would complete the whole work in less time than it has been found necessary to bestow on forming the plan, and developing the original conception of the Cyclopædia. One moment's reflection will suffice to shew, that precipitation would have defeated the great object in view, which was to obtain the co-operation of Men, whose names alone would be an authority on the various subjects on which their pens were to be employed. To accomplish this purpose required great exertions, much patience, and, in not a few instances, it was only by the most earnest and persevering entreaties, that eminent Individuals, reposing on the laurels they had already won in the field of science, could be induced to impose on themselves any fresh task. Nearly three years have been devoted by the Editor, to the collection from various languages, of the best sources for reference, to correspondences, and journeys throughout the three Kingdoms, for the purpose of personal interviews with distant Contributors. The result has been such as to justify the most sanguine anticipations. Eighty-six Contributors, are enrolled for the production of the Cyclopædia, amongst whom will be found some whose reputation is European—some who are honourably known to the Profession throughout these Realms—and all, or nearly all, already distinguished in the ranks of the Profession.

Without such a re-union of talent, it would have been impossible to achieve the object desired, which is to record the present state of Surgery in a manner that cannot fail to be useful to the Profession at large, as well as creditable to the Writers engaged in this important enterprise.

Another motive for retarding the publication, has been the desire expressed by the Authors of the earlier Articles, to be allowed time sufficient to do justice, as well to their own reputation, as to the importance of a Work, which, on all sides, is expected to assume a national character.

The Editor had deemed it better to put off the publication of any portion of the Cyclopædia, until the time when its maturity was so far established, that the several Numbers could be brought out in uninterrupted succession, rather than by a premature issue of some of the earlier Numbers, to incur the risk of any momentary interruption in its course, when once begun; and he has now the satisfaction of stating, from an inspection of a large portion of the manuscripts already sent in, that the Work, instead of exceeding the proposed number of parts, will in all likelihood fall short of it.

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OF THE

# CYCLOPÆDIA OF PRACTICAL SURGERY.

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Compression.
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*a* Ophthalmia, general inflammation.
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——— of adults.
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Kerato-conjunctivitis or Scrophulous.

*a* Encanthis.

*a* Aqueous Humour.
*a* Aquo-Capsulitis.
*a* Hypopion.
*a* Hydrophthalmia.

*a* Corneitis, or Keratitis.
*a* Pterygium, pannus.
*a* Staphyloma.

*a* Nebula.
*a* Leucoma.
*a* Albugo.

*a* Iritis, Choroiditis.

*a* Lens, Cataract.

*a* Pupil, artificial.

*a* Retinitis.
*a* Amaurosis.

Functional, (Retina.)
Organic, from Spectra, glaucoma, muscæ, half-vision, disfigured vision.

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* See Advertisement to the Reader, p. 4

- Functional, (Optic nerve.)
- Functional, from orbitar tumours, abscess.
- Organic, from lesions.
- Functional, (cerebral.)
- ——— from concussion.
- Organic, from effusions, tumours, ramollissement.
- ——— including Ptosis, strabismus, double vision.

- Functional, from congestion, exhaustion, including hemeralopia, nyctalopia, &c.
- Congenital.

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    - Ankyloglossus.
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    - Excision.
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    - *a* Thyroid Gland, Diseases of.
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*Genito Urinary Apparatus.*
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    - *a* Dysuria.
    - *a* Ischuria.
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    - Occlusion.
    - Imperforation.
    - Fissures.
    - Excrescence.

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*** *Subjects to the Names of which an (a) is prefixed, occupy a distinct alphabetical place in the Cyclopædia.*

# ADVERTISEMENT TO THE READER.

It may, perhaps, become a question in the minds of some, that in a work of so purely Surgical a character, as the present, any place should be assigned to the articles composing the Obstetric Division. The objections to which their introduction might be deemed liable, have neither been overlooked, nor slighted. After due deliberation it was thought most advisable not to exclude this matter, for the following reasons:—1st, That all the articles of the Obstetric Division, taken together, will not occupy even a single number of the whole work, and consequently that they might be fairly admitted without defeating the aim of the Projectors of the Cyclopædia, which is to impart the fullest information, in the concisest form.—2ndly, The Cyclopædia not being destined exclusively for any particular class of readers, but for the entire profession, it was presumed that a review of the present state of Obstetricy, in which the views and experience of the very able men to whom this section of the work is confided, should be interwoven, could not fail to be acceptable to most of our readers.—3rdly, Many of the duties of the Obstetrician consist of Manipulations so purely Surgical, that a sanction seemed to be given for the consideration of the whole subject, if for no better reason than to elude the reproach of being incomplete. These reasons, in our estimation, have had sufficient weight to counterbalance objections which, we acknowledge, have been to us a source of anxiety and doubt. We owe it, however, to the Profession, to confine those Obstetric Articles, which are strictly Medical, within very narrow limits.

# THE
# CYCLOPÆDIA
# OF
# PRACTICAL SURGERY.

---

**ABAPTISTA** from *α*, privative, and *βαπτίζειν*, to plunge (obsolete). A name used to designate the terebra, or conical-shaped circular saw of the ancient surgeons. Their object in employing an instrument of that shape was to prevent, as the name expresses, its penetrating beyond the bones of the cranium, into the dura mater and brain. (For a better means of obviating this accident, see TREPHINE.)

**ABDOMEN**, *venter, alvus.* Lat. *ὑπογάστριον, γαστὴρ*, Gr. *ventre, bas ventre*, Fr. *Unterleib, Bauch, Schmerbauch*, Ger. *ventre, pancia, abdomine*, Ital. *vientre, barriga, panga.* Span. *belly*, Eng. The *abdomen*, in Human Anatomy, is the largest of the three visceral cavities; and is situated between the thorax and lower extremities: it derives its appellation from the Latin word *abdere*, in consequence of its concealing, as it were, its contents. The term applies to the containing and contained parts; to the walls, and to the organs they enclose. The word cavity is a mere abstraction; in the integral state of a living man there is no cavity, the entire space being occupied by some of the principal organs of digestion, assimilation, secretion, generation, excretion, &c. After premising a few general remarks, we shall therefore consider successively the walls and the cavity of the abdomen.

The abdomen is situated before the lumbar portion of the vertebral column; above the pelvis, which may be considered as an appendage; and below the thorax, from which it is separated by the diaphragm, in man and mammalia. Its superior boundaries are not well marked exteriorly; within, it is defined by the diaphragm, a moveable septum, which alternately enlarges and contracts the two cavities, at the expense of each; hence a source of many errors in diagnosis, which are much more frequent than is generally believed.

*General considerations.* In the development of the human germ, the abdomen is the first part formed; it is, so to speak, the *radicle* of the future being: this is so strictly the fact, that the fœtus, however imperfect or irregular its formation may otherwise be, is always normal in the respect of possessing this portion of the organism. The abdomen, therefore, whether as regards man or the lower grades of animals, is the point from which the creature springs, and around which, according to his grade in the scale of beings, the other organs are grouped in succession; the abdomen and its contents are the primitive elements, the organs of first formation.

In comparing, on the skeleton, the abdominal with the cranial and thoracic cavities, we observe a very striking difference in the bony formation of each.

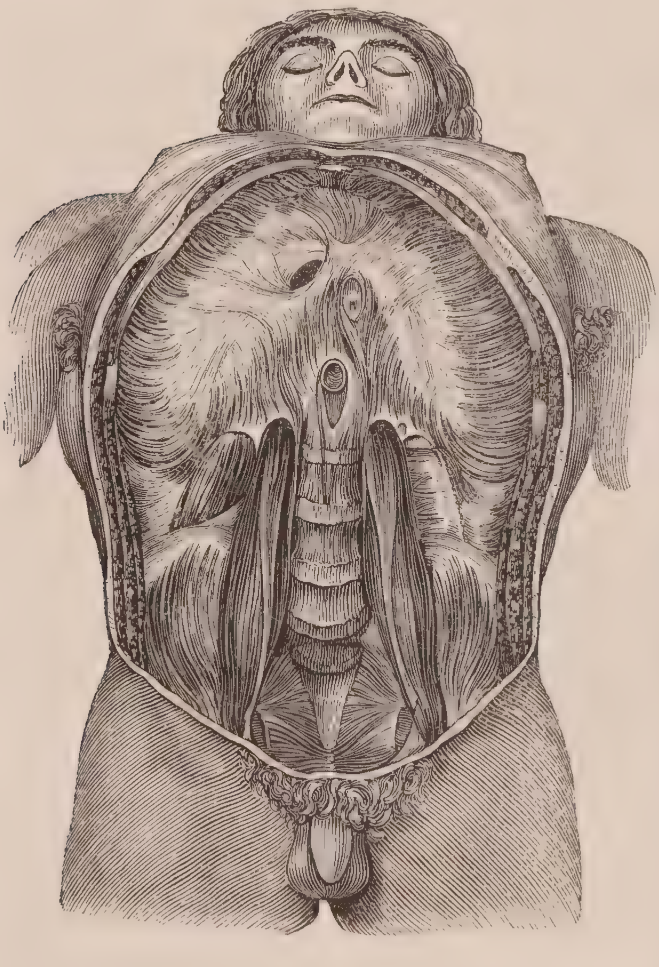
In the cranium, the most perfect physical protection is secured for its contents by their complete envelopment in bones of a certain hardness, formed and joined together in a peculiar manner.

In the thorax, bones form a very large portion of its limits, and afford ample protection to the contained organs; but as total immobility would here be incompatible with the due performance of the functions of these organs, the interosseous spaces are filled up, and the cavity completed by the muscles necessary to the act of respiration.

In the construction of the abdomen, we observe a complete contrast with that of the skull: in the latter, motion would be incompatible with function; in the former it is, to a great extent, indispensable. The thorax, as regards mobility, is the mean between these two extremes. The soft parts of the abdomen, therefore, predominate considerably over the osseous. Of the soft parts themselves, some enjoy great extent of motion, while others are as firmly fixed as the bones to which they adhere.

*Parietes of the Abdomen.*—As regards the parietes, therefore, and abstractedly from the nature of the parts that compose them, they may be considered as the *moveable* or floating, and the *motionless.* The *moveable* external walls, if detached all around from the edges of the bony frame, upon which they are spread out and supported, and if they are extended upon a plane surface, will represent the figure of a Maltese cross, the perpendicular limb, corresponding to the *linea alba*, from the xiphoid cartilage to the pubis ; the transverse, to a line curved in proportion to the size of the abdomen, drawn from the transverse processes of the lumbar vertebræ, on one side, to the same points on the other. The floating external wall being thus detached, the frame of the abdomen will represent a deep architectural niche, vaulted above by the diaphragm, (the remaining portion of the moveable walls) and excavated below, to form the well or pelvis ; the direction of the niche is somewhat oblique, being bent back at both ends.

Fig. 1.



*The cavity of the abdomen, the anterior moveable walls, and viscera removed.*

The frame itself is extremely solid, and contributes mainly to the sustainment and proper position of the organs which it shelters ; without this disposition, the erect posture would be impossible, and the viscera would crush each other. A space of unvarying dimensions being thus provided, the abdominal cavity is completed by parietes consisting entirely of soft parts. The unyielding protection of bone is now sacrificed to the necessities of function ; mobility and protection must be combined in the texture of the parietes ; in a word, the ever-varying bulk of the contained viscera requires extensibility in the walls to meet the condition of distension ; elasticity to restrain its excess, and to spring back in proportion as the distension diminishes ; and contractility to assist in the due performance of the functions of those organs. The structures endowed with these properties, are muscles, fasciæ, tendinous expansions, cellular tissue, &c. of which the moveable walls of the abdomen are exclusively formed.

It is not our purpose in this article to enter into a detailed description of each of these parts. These details are minutely and lucidly exposed in a more appropriate place,—*the Cyclopædia of Anatomy and Physiology, Art. Abdomen,* to which we beg to refer the reader. Our chief object being to give a rapid sketch of the surgical questions connected with this region, we shall enter no further into its anatomy than will be necessary to illustrate the various points under consideration,—to guide diagnosis,—or to form a ground-work for surgical precepts.

*Osseous Parietes.*—These are formed above, anteriorly by the ensiform cartilage of the sternum ; laterally by the lower ribs ; posteriorly by the lumbar vertebræ, sacrum, and coccyx ; and inferiorly by the ilia. Although, we refrain purposely from minute osteological details, it yet appears proper to point out the leading distinctive characters between the bones of the pelvis, and the ribs and sternum, with regard to the kind and degree of motion they derive from the action of the muscles. The latter, under the influence of muscular action are so moved, as to alter directly the position of the subjacent viscera ; so that we must here consider the bony walls of the abdomen as actively engaged in modifying the dimensions of the ventral cavity ; while the bony walls of the pelvis, on the contrary, remain during the action of the abdominal muscles unmoved, offering at the same time, however, a firm point of resistance, and thus permitting, through the medium of muscular contraction, pressure on the pelvic organs, and facilitating the propulsion of their contents. The internal surfaces of these bony walls are chiefly padded with muscles ; for the description of which we must refer the reader to the elementary works on Anatomy, and pass on to the consideration of the floating walls themselves.

*Soft Parietes of the Abdomen.*—These are formed for the most part of the flat or broad muscles, which derive their names from their position, form, or the direction of their fibres ; they consist of five pairs placed symmetrically with regard to the median line.

Viewed externally the abdomen represents an oval, convex in front, its long axis being vertical, broader below than above, particularly in females, from the naturally greater expansion of the pelvis after puberty in that sex ; the reverse of this obtains in the fœtus. Owing to the alternating contraction and dilatation of the walls of the thorax and diaphragm, the convexity of its outline varies incessantly during life ; in emaciated subjects it is not convex but flat, particularly after death.

The combination of muscle and aponeurosis in the composition of the moving walls of the abdomen is highly important; they are distributed according to the relative necessities of contractility and resistance. Thus we observe where the former is required, muscle is the principal constituent; where, on the other hand, contractility may be dispensed with, as in the case where provision must be made for the transmission of vessels, &c. the powers of resistance are duly provided for, by means of strong tendinous expansions. Wherever great resistance is necessary, and such is the case, at the points where the pressure of the muscular walls upon the viscera, from the direction of the axes of the abdominal cavity, is more particularly directed, recourse is had to this organic element for protection. Some difference in the distribution of aponeurosis is observable in man, and in large quadrupeds; in the latter it abounds at the thoracic extremity of the abdominal cavity, in the former, at the inferior or pubic portion; an argument, if such were necessary, of his destination for the erect posture. These aponeuroses form perfect sheets, except at the points where arched apertures of various sizes are left for the transmission of vessels, or for the commencement of canals, which are often occupied, in addition to the parts thus transmitted by cellular tissue, and pellets of adipose substance.

The whole extent of the moveable walls may be traced from the bottom of the sternum, along the margins of the inferior ribs, the transverse processes of the lumbar vertebræ, the ridge of the ilium, and stretching across like an arch, from the anterior superior spinous process of this bone to the angle of the pubis: it presents above a small depression, *scrobiculus cordis*, in which the xiphoid cartilage may be felt; this body, constituting as it were a link between the sternum and linea alba, is cartilaginous, flexible, and elastic, more or less depressed in different subjects. About the middle is found the umbilicus, a species of cicatrix, the vestige of the opening which served to transmit the umbilical vessels. Below, the abdomen terminates at the pubis; laterally from this point, towards the ilium, it forms in connexion with the upper part of the thigh, the fold of the groin. The whole is divided into regions, which though arbitrary are useful alike for description and diagnosis, and which shall be noticed hereafter. The upper and lower portions of this moveable wall are narrowed by the convergence of the ribs towards the sternum above, and of the ilia towards the pubis below; in the middle it passes round on each side to the transverse processes of the lumbar vertebræ, and in consequence of the absence of bone throughout this extensive region, it is naturally disposed to yield the most to any distending force.

Before we enter upon the description of the muscles of the abdomen, it will be better, in order to understand their attachments, first to describe the aponeurotic expansion on the anterior part of the abdomen, and which is in fact produced by the tendons of these muscles. When the skin and superficial fascia have been removed from the fore part of the abdomen, an expanded surface of fascia presents itself, reaching from the sternum to the pubes, *above* occupying the space between the two external abdominal muscles, and *below*, that between the two ilia, the pubes dividing this lower margin of the abdominal tendon into two distinct free oblique edges, which are termed Poupart's ligament. On a closer contemplation of this general tendinous expansion, three particular opaque lines arrest the attention; a central one passing in the long axis of the abdomen from the sternum to the pubes, called the *linea alba*, and two lateral lines named the *lineæ semilunares*, which sweep in the form of a crescent from the junction of the cartilage of the eighth with the seventh ribs, to the spinous processes of the pubes. The greater opacity of these lines, as compared with the rest of the fasciæ, is caused by the conjunction and interlacement of the tendons of the three flat pairs of the abdominal muscles.

*Abdominal muscles.*—Our observations on these shall be brief and general. The most external covers a considerable space anteriorly, and laterally, extending from the lower and lateral part of the thorax down to the crista of the ilium, and from the spine of this bone to the pubis: from the ribs to the ilium its posterior edge is free; its fibres run in various directions towards the *linea alba*; it joins the tendon of the muscle just beneath it at the *linea semilunaris;* the edge extending from the ilium to the pubis is free towards the thigh, and thickened, particularly in its iliac portion, by its continuity with the tendon of the internal muscle; the part of it that is attached to the pubis is divided into two portions or pillars, leaving between them a space in which the spermatic cord in the male, and the round ligament in the female, pass out of the abdomen. Beneath this external layer, a second muscle *(the internal oblique)* is spread, extending from the bottom of the sternum and the cartilages of the ribs to the ilium, cohering with the iliac portion of the lower tendinous border of the preceding muscle; it becomes tendinous at the *linea semilunaris.* Beneath this muscular layer another is concealed; it extends farther behind towards the vertebræ, with which and the ilium it is connected by stronger fasciæ, than either of the two superposed layers; like them, it becomes tendinous at the *linea semilunaris*, and meets its fellow of the opposite side at the *linea alba.*

Before I proceed to describe the straight and pyramidal muscles of the abdomen, it is important to contemplate the direction of the muscles already mentioned collectively, duly to appreciate how perfectly they are adapted to prevent the protrusion of the abdominal viscera, and to produce an equable muscular pressure upon them, during their contraction. It is to be observed how the fibres of the external oblique muscle descend and terminate tendinous below, while the fibres of the internal oblique ascend, and decussating with the fasciculi of the external muscle, terminate tendinous above; and, lastly, how this transverse muscle has its fleshy fibres, so intersecting the decussation of the other two, as completely to close the opening which would otherwise have remained, and have left the viscera constantly exposed to the liability to protrusion. A thin flat muscle *(the rectus)* is extended, ensheathed throughout its entire extent, except for a little way at its lowest part, between the layers of the tendons constituting the *linea alba,* from the pubis to the *scrobiculus cordis;* it is divided transversely by tendinous intersections *(the lineæ transversæ).* The sheath contains another muscle *(the pyramidal)* which also ascends from the pubis, about half-way towards the umbilicus.

The other moveable wall (the diaphragm) is concealed from view, and constitutes the superior boundary of the abdominal cavity; it forms a septum between the abdomen and thorax, ascending deeply even in its quiescent state, into the base of the latter. By this disposition, the upper part of the oval formed by the abdomen as a whole, is spliced, as it were, into the thorax; so that an instrument penetrating horizontally from the back part of the trunk, at any point between the top of the xiphoid cartilage, and the last intercostal space, would pass through the cavities, both of the thorax and abdomen. The action of this muscle is as essential to the function of respiration, as its influence is important upon the abdominal viscera.

The inferior boundary is formed by the pelvis, the excavation of which seems to be an appendix or prolongation of the general cavity. The soft walls in this region possess but little mobility, and consist of the ischio-coccygeal and levatores ani muscles, with an aponeurotic arrangement containing other muscles, &c., proper to the perineum, by which this space is closed.

So far as the osseous, fibrous, and muscular structures serve to form the parietes for the abdomen, they have been noticed; but as allusion has been made to the passage of vessels, nerves, &c., in and out of the cavity, it is obvious that some other tissues are required for the safe occlusion of these outlets, as well as for the purpose of strengthening the parietes generally, and modifying the influence of muscular action upon the abdominal viscera. Accordingly we find entering into the structure of the abdominal walls, cellular tissue, sometimes abounding in small pellets of fat, fascial expansions enveloping the muscles, and a serous membrane, with a free surface, lining the walls and giving a covering to the contained organs throughout almost their entire extent. The fascial expansions are prolonged in the form of more or less perfect sheaths into the outlets, together with cellular tissue and fat: this latter point is peculiarly deserving of notice, as these fatty nodules dilate the openings, when the nutrition is in a high state of activity; thus favouring, if emaciation should suddenly supervene, the protrusion of some portion of the abdominal contents. Under circumstances where these adipose productions have a firm connexion with the cellular surface of the peritoneum, they have been known so to draw upon the serous membrane, by their augmentation of volume, as to form funnels, in which the contained organs have been compressed, and even incarcerated. This has been observed more particularly to occur in the course of the natural outlets; but they have also been known at other points, above the umbilicus, for instance, to produce such distress by making traction on the peritoneum, as to simulate the effects of a strangulation.

The only point of importance, as regards these tumours, is to distinguish them from protrusions of the abdominal contents, and this is, in general, an easy matter, when the tumour is not the seat of pain on pressure, when it is situated near or above the umbilicus, or over the region of the liver, when it has been formed slowly, is irreducible, pediculated, and round. But this is by no means the case, when there are colicky pains in the abdomen, vomiting, and constipation. They vary in size from that of a nut to that of an egg; they are round, smooth, or knobbed, and of the consistence of firm fat, producing neither pain nor inconvenience. Their formation is very simple: a small pellet of adipose substance, adherent to the peritoneum, is pressed out through a slit or natural aperture, until it gets beneath the skin, where it gradually increases in bulk. As it still holds by the peritoneum, it draws upon it, through the narrow opening which had originally given it passage. Instances have been observed, in which the falciform ligament of the liver, and the cord of the umbilical vein had been drawn on in this manner: they also occur in the usual situations of herniæ; when small, and that the opening through which they had reached their superficial situation is large, they may be easily reduced; but when the disproportion between the opening and the tumour is considerable, it is wholly irreducible. These adipose tumours have often betrayed some of the most experienced surgeons into mistakes, and indeed, in many cases, nothing is more difficult, than to avoid confounding them with a strangulated hernia. Pelletan and Scarpa operated in such cases; the latter not discovering his error, until the tumour was exposed: he removed it, and the patient got well. Cruveilhier relates another case that occurred to Dupuytren. In some instances, where an operation had been performed, the issue was not so fortunate; the patients died, in some cases, from pre-existing peritonitis, the real nature of the tumour not being detected till after death. Velpeau relates a case in which he was on the point of operating: the patient died from partial peritonitis, with the formation of small abscesses; but the peritoneum connected with the tumour was not inflamed.

When the tumours have been cut down

upon, under the supposition of their being hernial, and excised, the symptoms have yielded at once; a circumstance which would seem to show, that of themselves, they do, in some instances, either by their traction on the peritoneum, or, the strangulation of their pedicle, give rise to symptoms simulating an incarcerated hernia.

The most important of the outlets of the abdomen, possessing high surgical interest in relation to the occurrence of protrusions, are situated between the ilia and pubis, corresponding to the lower border of the moveable abdominal wall. The minute description of these openings is reserved for the article Groin. (See also Hernia.)

The cutaneous surface of the abdomen presents the same general characters as the skin of other parts of the body. As we have already remarked, it is calculated by its structure, to add strength to, and to favour the free motion of the parts it covers. On the posterior region of the abdomen, it is thicker and less sensitive than on the anterior. At the age of puberty, the skin covering the pubis, and the neighbouring parts is furnished with hair. The integuments of the abdomen are subject to all the changes which affect the other structures, in consequence of the variations of volume in the contained organs; thus, after uterine gestation, and certain diseases of the organs in the abdomen, upon the removal of the cause of distension, the skin having lost in some degree its elasticity, falls into furrows or wrinkles, which assume a transverse direction.

The structure and organization of the abdominal parietes having been thus rapidly sketched, we may now make a few observations on the aspect which they collectively present. It has been already stated that the abdomen in front presents to the eye a contour of an ovoid form; but it is difficult to fix its just limits externally, on account of the continuity of the soft parts with those of the thorax: but though indistinct, the frame work nevertheless may be made sufficiently prominent, to assist us in dividing the whole into certain portions, to which we shall advert presently.

The general form and comparative size of the abdomen to the other cavities of the body varies at the different epochs of life, and the capacity of its cavity seems to bear some relation to the quantity and kind of food taken; hence it is found, that in the infant the cavity of the abdomen is larger than at any other period of life, corresponding to the relatively greater quantity of food then required; while in old age its capacity is lessened when the activity of digestion is diminished, although its external parietes frequently, at this period, become distended by an accumulation of fat. In the two sexes also there is considerable difference in the form of the abdomen, being proportionably smaller and shorter in the male than in the female, more particularly in the lower part; the width of the ilia in women is also greater than in men.

*Surgical regions, or sub-divisions of the abdomen.*—Certain arbitrary divisions have been arranged with a view to assist the surgeon in forming a diagnosis, and directing his operations as emergency may require. These divisions are equally valuable to the physician in guiding his explorations of the abdominal organs. Velpeau's plates are sufficiently clear to answer our purpose in tracing these divisions, and we accordingly reproduce them.

Fig. 2.

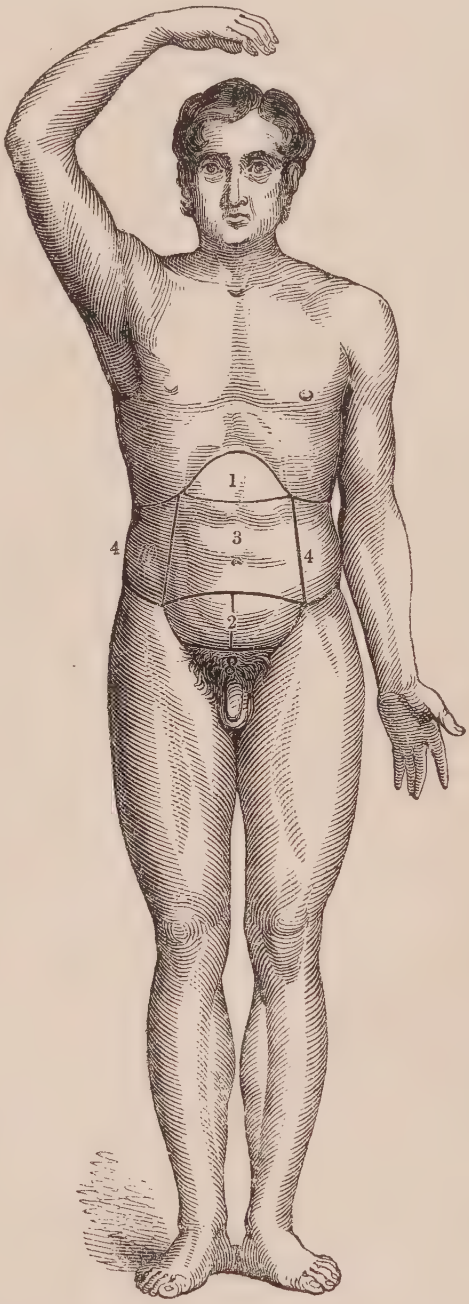
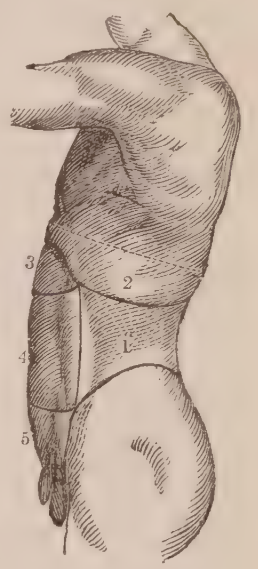


Fig. 2 represents the front of a human figure, exhibiting the regions of the abdomen. The curved line running across the middle of the body, above the small division (1) marks the limits of the two great splanchnic cavities respectively. Another line drawn from the crista of the ilium on one side descending in the fold of the groin, crossing the pubis under (2), and ascending the fold of the groin of the opposite side, till it reaches the crista, marks the limit of the moveable wall of the abdomen below. The line traced on the edges of the lower ribs, and passing under (1), and that corresponding to the cristæ of the ilia, and running above (2), form three large zones, which are again subdivided into regions. The first of these zones comprises two lateral regions, the right and left hypochondria, and a central one, the epigaster. This last (1) occupies the space between the diverging ribs ; at its upper part, the xiphoid cartilage is felt. The aponeurosis here is thin and weak ; its resistance to protrusions is, however, sufficient, there being but little pressure from the internal organs, except under circumstances of great distension. Abscesses of the mediastinum sometimes point here ; its own cellular tissue may also be the seat of a purulent collection, which may fuse in the direction of the *linea alba*. Distressing pulsations simulating aneurism are sometimes felt here, particularly by hypochondriacal and nervous persons ; they may arise from the throbbing of the cœliac artery, or what is much more common from nervous twitchings, similar to those which occur in other parts of the intestines, the cæcum and colon more especially. We shall notice the other two regions, when we speak of their relation to the internal organs.

The second zone, the umbilical, is subdivided into a central, (3), and two lateral regions, (4, 4). The umbilicus is placed in the centre of this zone ; the skin is intimately adherent to this organic remnant, in consequence of which, when the walls of the abdomen become loaded with fat, it sinks in, and forms a funnel shaped depression. The obliteration of the umbilicus is often so imperfect at birth and in the early months of existence, that the intestines, by passing into the unobliterated cul de sac, elevate it into a tumour, which gradually diminishes as the child grows ; later in life, the umbilicus presents a fibrous knot, so much more resisting than the surrounding parts, that Scarpa believed the protrusion of any part of the intestinal tube through it, to be impossible. The surrounding parts, however, and especially after excessive distension, may be very much weakened, and their fibres so separated, as to facilitate protrusions. The fatty herniæ, of which we have already spoken, are liable to occur in this region, owing to the small openings occurring here and there in the tendinous layers of the muscles (See Hernia) ; the tendinous intersections of the rectus muscle are remarkable in this region ; Velpeau considers, that they quintuple the strength of the muscle. The arteries of this region possess some surgical interest, in the operations of paracentesis, and hysterotomy (see those articles). When incisions are had recourse to, it is a rule to cut in the direction of the fibres, which being straight in this region, the incisions should be straight also. The iliac vessels on the lateral limits of the region may be of such a size, as to furnish a good deal of blood. Incisions on the median line may generally be entitled to a preference, and even Sir A. Cooper has been heard to regret, that he had not made his incision in this situation, upon the occasion in which he tied the abdominal aorta. The two lateral portions of this zone are, the lumbar regions ; they occupy the open space between the margins of the false ribs, and the crista of the ilium, extending backwards under the longissimus dorsi ; a part only of it therefore is seen in the front view of the abdomen. Its entire extent is shown in the next figure (1), together with the left hypochondrium (2), and a portion of the epigastric (3), umbilical (4), and hypogastric (5) regions in profile.

Fig. 3.



The cellular tissue of this region communicates under the twelfth rib with that of the cavity of the thorax, and may be the seat of congestive abscess in consequence of caries, either of the ribs or vertebræ. Other abscesses of a nature less serious occurring in this situation may be confounded with one of a symptomatic character. Velpeau mentions two cases of chronic idiopathic abscess, in one of which the life of the patient was saved by a free opening, followed by speedy cicatrization of the sides of the purulent cyst.

At the back part of this region, there is a weak space sometimes left behind the thin edge of the internal oblique, and the transversalis, which with the thin lumbar aponeurosis may yield before the pressure of the abdominal viscera. J. L. Petit mentions his having seen a case of hernia in this situation. Callisen, from having observed the thinness of the abdominal covering at this point, proposed selecting it as a proper place to establish an artificial anus, in the case of infants born with imperforate rectum. Anthrax and phlegmon are not unfrequent in this region, which is clearly attributable to its abounding in cellular tissue. Urinary fistule from the kidney is sometimes, though rarely, observed in this region. Moxæ, issues, &c. are some of the surgical applications that may be here employed.

The third zone is the lowest, and may also be divided into its centre ( (2), plate 1) the hypogastric, and right and left inguinal regions. Some of the most important operations in surgery are performed on these regions : for instance, the operations for strangulated hernia, for puncturing the bladder, the high operation of lithotomy, &c. Secondary abscesses from violent cystitis, sometimes occur in the cellular tissue of the hypogaster ; matter formed after psoitis, or from disease of bone, as in congestive abscess, often point in the inguinal regions. (See Groin and Hernia.)

In the posterior view there is nothing to correspond, with the upper and lower zones, observed in the front view. Here, strictly speaking, there is but one zone for the abdomen contained within the limits of the curved line which separates it from the thorax above, and the gluteal regions, marked by two arched lines extending from the median line of the sacrum, upwards and outwards over the ridges of the ilia.

Fig. 4.

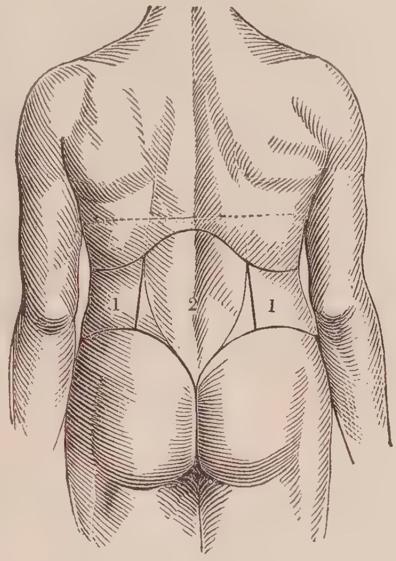


Fig. 4, shows the posterior portions of the lumbar regions (1, 1); and (2) the centre of this zone. The dotted lines show the ascent of the cavity of the abdomen within the basis of the thorax.

In terminating our description of the parietes of the abdomen, we should remark, in the distribution of the parts entering and issuing from the cavity, what great care has been bestowed, in guarding against protrusions of its contents. An illustration may be borrowed from a comparision of the cavities of the thorax and abdomen. In the former, a state of permanent distension, provided for in the structure of its partly bony walls, resists the extremes both of distension and collapse. When the muscles have dilated the chest, the capacity of the air-cells of the lungs is augmented, and the air rushes down the trachea; the dilating effort being now suspended, the elasticity of the bones of the thorax, and of the lungs themselves, is sufficient to expel the air out of the chest; but to both these states there is a limit which is soon attained. The opening by which parts are allowed to pass into this cavity is large, the tendency of the contained parts to protrude being comparatively slight. In the latter, the reverse is the case; the tendency of the organs to escape from the pressure which they are undergoing in every direction, is so great that it requires to be counteracted by the dissemination of the organs to be transmitted, over different points. The parts transmitted are visceral, vascular, nervous, or cellular. Now, if but one opening existed for the transmission of all those parts, protrusions from the upper or lower boundary of the abdomen, would be constantly occurring.

Before we pass from the walls of the abdomen to the organs they enclose, let us examine against what point of those walls the pressure of the internal parts must be chiefly directed. The axis of the cavity is not perpendicular. The slight inclination backwards of its upper extremity, and the still deeper deflection, backwards and downwards, of the lower one, to form the excavation of the pelvis, oblige us to consider the direction of a separate axis for each. This difference of direction is advantageous in decomposing the superfluous force of muscular action. The direction of the superior axis in the erect posture will correspond to that of a line drawn from the centre of the diaphragm to the pubis; that of the pelvic portion, ascending from the coccyx, will bisect the long axis at a point about midway between the pubis and umbilicus. The relative directions of both will vary of course according to the different attitudes. In this position, as well as in the attitude of kneeling or riding, all the force of the muscular bag, constituting the walls of the abdomen, is concentrated at its lowest part; thus pressed upon, the viscera are naturally impelled along the inclined plane formed by the iliac fossæ, against the crural arch and the sides of the pubis. But when the body is bent forward, as in the act of expelling the fæces, the two axes, instead of forming an obtuse angle at their point of junction, come nearly into the same line; the direction of the force, instead of being in the line of the pubis, points towards the coccyx.

We shall see on examining the internal organs, the provision made to obviate the effects which would be likely to result from this direction of the pressure against the lower part of the abdominal walls, by relieving them from the weight of the viscera themselves.

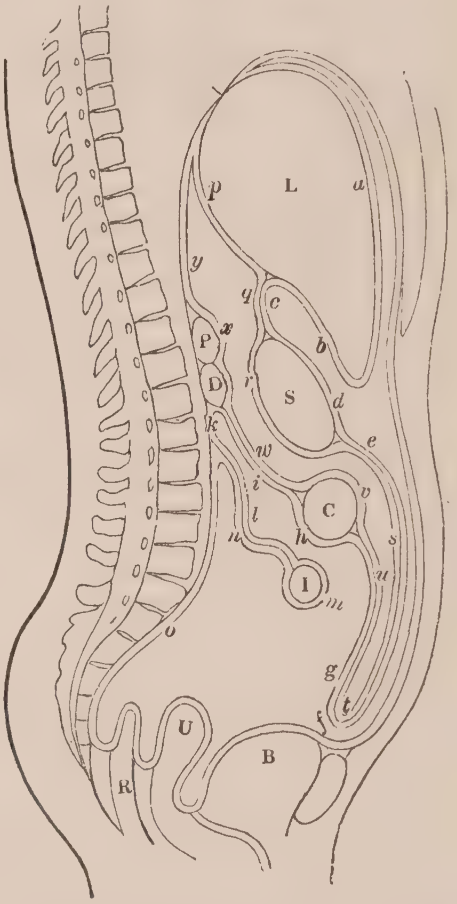
The proportion between the power of the muscles and the resistance of the viscera is so justly poised, that except under circumstances of unusual violence, there is no liability to injury to either the one or the other Unyielding rigidity of the walls exposes the internal organs to laceration. A horse strains violently under his load, and drops down dead,—the aorta is ruptured. A person falls from a height, the muscles contract violently, and the liver or spleen is ruptured. In other circumstances this rigidity may have a protective effect. A person falls from a vehicle heavily laden; the wheels passing over his abdomen, the internal organs are uninjured; the violent contraction of the muscles has enabled the abdominal viscera to escape the crushing which must have otherwise been mortal. A fatal lesion may even be the consequence of the opposite condition. The abdominal walls are totally relaxed; their suppleness and elasticity is such as to enable them to transmit the action of a contunding force to the internal organs, capable of destroying them, while they themselves remain uninjured. Mr. Jobert relates a case, in which a person with an irreducible hernia received the kick of a horse in the abdomen. He had the usual symptoms of fainting, vomiting, &c. of strangulated hernia; an operation was performed which was useless; the jejunum, after death was found to be completely divided.

Internally, the abdomen forms a perfect cavity, the boundary of which is everywhere traceable, and is lined throughout by a serous membrane called the peritoneum, which, by prolongations within itself, more or less completely invests the several organs, and thus suspends and maintains them in their respective regions. This serous membrane consists of two sacs, the larger one being that which is opened in a section of the parietes, and the smaller one, that which is behind the stomach, and which is consequently hidden from view. The two sacs are continuous with each other, behind the right edge of the omentum minus, at the opening called the Foramen of Winslow; and therefore there is virtually but one sac, which by reason of its arriving at the various organs, and by climbing up the vessels which supply them, assumes an arrangement which at first sight appears complex.

The larger sac extends from the base of the anterior aspect of the liver (where it forms a cul de sac by its reflexion from that organ to the diaphragm), to the pelvic outlet, where it again forms one or more cul de sacs by its reflexion from the rectum to the bladder in the male,—and from the rectum to the vagina, and from the uterus to the bladder, in the female. It covers the convex surface of the liver (*a*), and its concave surface (*b*), as far as the transverse fissure; next, it forms the anterior layer of the omentum minus (*c*), being in front of the hepatic organs; then it furnishes the anterior covering of the stomach (*d*), which on the left side creeps along the splenic artery to pass around the spleen, and, by its being reflected from that organ to the left crus of the diaphragm, it loosely binds it against the posterior wall; from the stomach it descends on the omental branches of the gastro-epiploic vessels, and constitutes the first or anterior layer of the omentum majus (*e*); this layer turns backward, and ascends (*f*) as the fourth or posterior layer (*g*) of the same omentum, until encountering the colon (C) crossing the abdomen, it adheres to that part (*h*) which is posterior to vessels which supply it; it then passes upwards and backwards (*i*, *k*) to the spine, to which it is fixed, forming the inferior layer of the transverse meso-colon; it again changes its direction and turns downwards, but it is now fixed, being in front of the aorta, vena cava, and part of the third portion of the duodenum; at an oblique line drawn from the left side of the second lumbar vertebra towards the right iliac fossa, it ceases to be fixed, and advances on the front of the superior mesenteric vessels (*l*) to the jejunum and ileum (I); and, at the point where the vessels enter, it passes around the intestine (*m*, *n*) to the posterior part of the same vessels by which it is conducted to the spine, these two portions forming the suspensory of the small intestines, or the mesentery (*l*, *n*); it then descends (*o*) into the pelvis, where it is in a fixed state, but by tracing it from one side to the other, it will be observed that on the middle line it becomes loose, advances to the posterior part of the rectum, passes around the surface of that viscus to the same point, and retires to the sacrum, constituting the meso-rectum, between which the internal hemorrhoidal artery insinuates itself; from this point it passes on either side attached to the walls of the pelvis, and to the posterior surface of the bladder, from the fundus of which it becomes continuous with the lining of the anterior parietes of the abdomen.

The obliquity of the attachment of the mesentery will admit of our designating the two laminæ of which it is formed, the one as the superior or right, the other as the inferior or left lamina; the former passes to the right side on the ilio-colic, right colic, and middle colic arteries, and at the spot where their distribution to the cæcum and ascending colon commences, it passes around those parts of the great intestine to the opposite side of the vessels, and it is then reflected outwardly on to the walls of the abdomen, the two laminæ being termed the right colic ligament: the latter passes to the left side along the left colic and anastomosing colic arteries to the descending colon and its sigmoid flexure, where an arrangement similar to that of the right side obtains.

Fig. 5.



L, *the liver;* S, *the stomach;* C, *the colon;* I, *the ileum;* P, *the pancreas;* D, *the duodenum;* B, *the bladder;* U, *the uterus;* R, *the rectum.*

The smaller bag, that which is behind the stomach, may be considered as a pouch of the greater bag thrust through a ring behind the vessels of the liver. It extends from the base of the posterior aspect of the liver to the point where the first or anterior layer of the great omentum changes its direction, and becomes the fourth or posterior layer. It also forms a cul de sac against the spleen, where it is bound to the left crus of the diaphragm. At its upper part it is reflected from the right crus of the diaphragm to the liver, and assists that formerly mentioned to sustain that organ; it covers the lobulus spigelii (*p*) and at the posterior lip of the transverse fissure it becomes loose, descends (*q*) behind the hepatic organs to the stomach, forming the posterior layer of the omentum minus; this layer descends adhering to the posterior surface of the stomach (*r*), and by the aid of the anterior layer suspends that viscus from the porta of the liver; from the stomach it descends behind the omental vessels, being the second layer (*s*) of the great omentum; at the point (*t*) when the exterior layers form a cul de sac, it also changes its direction and ascends as the third layer (*u*), until it arrives at the transverse colon (C), the anterior surface of which (*v*) it covers; from hence it passes loosely to the spine, forming the superior layer (*w*) of the transverse meso-colon; as the inferior layer (*i*) of this transverse meso-colon turns downwards from this point, and became fixed, so this superior layer (*x*) turns upwards and becomes fixed, it being adherent to the anterior surface of the pancreas (P), from which, in fine, it passes to the right crus of the diaphragm, the point at which the description commenced.

After thus tracing the peritoneum, as it suspends and attaches the abdominal organs, we may return to the regionary divisions, and enumerate rapidly the organs appertaining to each; the value of this mode of studying the cavity will now be apparent, as the correctness of our diagnosis in lesions of these organs, will often depend on our ability to point out their precise positions.

In the epigaster, we find the largest portion of the left lobe of the liver, the lobulus spigelii, the right portion of the stomach with the pylorus, the first and second divisions of the duodenum, the pancreas, and upper part of the great omentum, the vena porta, the splenic and superior mesenteric veins, the vena cava, the aorta, and cœliac axis, and around them, the large solar plexus, the great centre of the nerves of organic life, forming, as Cruveilhier happily expresses it, in itself "an abdominal brain," the vicinity of which to the scrobiculus cordis, may account for the exquisite sensitiveness with which in some individuals this point is endowed, and the sense of pulsation, fluttering or sinking, which are sometimes ascribed to the existence of an aneurism, or to some organic affection of the liver or stomach. We find also the transverse arch of the colon; and at the back part of the region, a portion of the vertebral column and thoracic duct.

The right hypochondrium is filled by the liver, the gall-bladder, the angle formed by the first and second portions of the duodenum, a portion of the vena cava *above*, and the upper extremity of the right kidney *below*. This organ may be explored, under the cartilaginous edges of the false ribs.

The left hypochondrium contains the great cul de sac of the stomach, its cardiac orifice, with the pneumo-gastric nerves spread out upon it, a small prolongation of the left lobe of the liver, and the spleen attached to the stomach, by the gastro-splenic epiploon, the tail of the pancreas, and a portion of the arch of the colon, as it is continued to the descending colon. In the enlargements, either of the spleen or liver, these organs project from beneath the edges of the ribs. The spleen is sometimes so enlarged as to descend to the iliac region. This condition is observed more particularly after long standing intermittent fever, and is known under the name of *ague-cake.* Whenever such enlargement of either of these viscera occurs, they may be felt beyond the range of the hypochondria. Under these circumstances, they will of course be much more liable to rupture from falls or blows, than when they enjoy the protection of the ribs. In the fœtus, and even after birth, the liver, from being relatively larger than it is in the adult, is exposed to rupture from the deficiency of this protection.

The umbilical region is occupied by the great omentum, the convolutions of the small intestines, with its mesentery including its lymphatic ganglia, lacteals, and blood-vessels, the vena cava, and abdominal aorta, and the vertebral column.

In the right and left lumbar or renal regions, are seen the ascending colon for the right, and the descending for the left, a portion of the convolutions of the small intestines, and behind the colon, the kidney, and a portion of one ureter for each of the regions.

The hypogastric region shelters the inferior convolutions of the small intestines, the pelvic portions of the ureters, and deep in the excavation of the pelvis, the bladder in man, the bladder and uterus with its appendages in the female, in both the rectum.

The right and left iliac regions contain (the right) the cæcum with its appendix, and the commencement of the colon, forming by their continuation with each other, the ilio-cæcal valve, the bifurcations of the aorta and vena cava; (the left) the sigmoid flexure of the colon, and commencement of the rectum. In cases of imperforation of the anus, or of alvine concretions blocking up the rectum, it has been proposed by Monro the Second to open the abdominal wall of this region with a view to the formation of an artificial anus. Mr. Pring performed this operation in a case of schirrhous rectum. M. Duret, in a case of imperforate anus, arrived at the S of the colon in this manner, carrying it out through the lips of the external incision, for the purpose of establishing an artificial anus. It appears, he opened the peritoneum; an inconvenience which he might have very easily avoided by reaching the intestine, and opening it on the posterior surface. This operation differs from that of Callisen, which attacked the colon higher up, and from the back part of the lumbar region. It is through an opening in this region also, that the iliac arteries are tied. Some of the ablest surgeons, Abernethy amongst others, recommend the incisions to be made in an oblique direction from the groin to the flanc, in order to avoid wounding the epigastric and circumflex arteries.

We should now consider the relations of the peritoneum to the contained organs, some of which it loosely suspends, while it firmly binds down others. With respect to the mode of these attachments, they may be divided into three orders; namely, organs that are fixed, organs that are floating, and a third class in which these two qualities are for the purposes of function associated, and in which the organ undergoes such changes, as to be free and prominent at one time, and fixed and hidden at another.

In the first class, we may place the kidneys with their appendages, the liver, pancreas, and spleen; these are the organs that suffer most from the shock of falls, blows, or counter-violence, and the effect may be easily understood. They are soft in texture, and their power of yielding is limited; two conditions which render them highly susceptible of the influence of shocks upon other regions of the body; and thus we see explained the effect of a fall on the head in rupturing a bulky and soft organ like the liver. In the second class are the small intestines, the arch of the colon, and the large omentum. In the third class, we enumerate the stomach and duodenum, the uterus and its appendages, the bladder and rectum: all these organs dilate from their fixed points, and when thus dilated extend into vicinal, and even into remote regions. Thus the stomach when distended presents its large curvature to the anterior wall of the abdomen, when collapsed, its anterior surface; the bladder ascends above the pubis, sometimes attaining a height above the hypogastric region; the body of the uterus, in the progress of gestation, quits the cavity of the pelvis, its fundus reaching as high as the epigaster. In these dilatations, one thing is worthy of remark; namely, that the distended organ maintains a close relation with the anterior wall of the abdomen. The same observation will apply to ovarian or other tumours developed within the abdominal cavity.

Although, as a general rule, tumours developed in the cavity of the abdomen are in immediate relation to the anterior wall, some interesting observations are recorded by Dr. Baron of Gloucester, in the Medico-Chirurgical Review, (No. 29, 1831) in which the paracentesis of these tumours would have been inevitably attended, in the one instance by puncture of the stomach, in the other with that of the bladder; these organs being interposed between the tumours and the anterior wall. The fact was ascertained by the cadaverical examination. (See Paracentesis, Ovaries.)

We may now have some notion of the important office which the peritoneum performs in regard to the organs of the abdomen. Some it binds down firmly; to others it gives a range of space in which their natural peristaltic motion may have free play; whilst to a third class, it gives a momentary power of expansion to be again confined within their original narrow limits: all which it effects without intricacy or confusion, by successively suspending the different organs over various points of the abdominal cavity, in such a manner as to prevent the weight of the incumbent viscera from adding to the force of pressure against the weak points of the abdominal walls, and which without this precaution would be often overwhelming. How truly admirable must that arrangement be, by which (not to speak of other organs) an intestinal tube, ever-varying in its diameters, equalling in its length, six times the height of the individual, is folded into convolutions which maintain contact without confusion, and which mix and move perpetually without knotting with or impeding each other!

One word more on the elasticity and extensibility of the viscera and walls of the abdomen. In the enormous development of the abdominal parietes, as in ascites; or of both parietes and viscera, as in tympanitis, although the distention may be excessive, the intestines are never ruptured from this cause, but the walls of the abdominal cavity may be so overstrained as to be rendered incapable of quick and perfect resiliency upon the organs, on the sudden removal of the distending cause. This loss of elasticity in the walls involves the loss of due pressure upon the viscera; the secondary effects of which may be very serious. In ascites, the abdominal circulation is sustained in relation to the presence and pressure of a large accumulation of fluid; let this fluid be suddenly removed by paracentesis, without any precaution being taken to continue the accustomed pressure artificially, the abdominal vessels being freed from the pressure of the mass of fluid become highly congested, the blood is returned but languidly to the heart, the centre of the circulation flutters, the pulse becomes unsteady and small, and syncope, and even death may supervene. After parturition, too, where the distension has been excessive, the effects of the sudden abstraction of pressure are observable, and may continue for weeks, the woman complaining of pains in the loins, weakness, bearing down, loss of appetite, and wasting. The function of the abdominal parietes is in abeyance, and must be represented by a circular bandage applied with moderate tightness round the abdomen. These excessive distensions, however, it should be remarked, have the effect of weakening the abdominal walls, thinning the muscles, and slitting the aponeurotic fibres, and thus of increasing to a great extent the liability to protrusions of the viscera.

The organs contained in the cavity of the abdomen suffer from displacement; we are not now alluding to the case of a transposition of the viscera, but to the displacements known under the general denomination of herniæ, under which head they will be more properly placed in a work of this kind.

*Abscess in the walls of the Abdomen.*—The principal purulent collections of the abdomen fall under consideration in the general article, Abscess, Psoitis, Urinary Extravasation, &c. In this place we shall only offer a few general reflections on the subject.

The cellular tissue of the moveable abdominal walls is sometimes the seat of anthrax, furunculus, and abscess. The pus may form in the cellular substratum of the peritoneum, between the muscles, or, in the case of anthrax, immediately under the skin. The development of these collections is attended with fever and excessive pain, aggravated by the movements of the abdominal parietes; from the resistance they meet with from the muscles and aponeuroses, they are at first flat, and but slightly elevated, having a tendency to be diffused, rather than to point; they make their way to the surface but slowly, and at last, when they reach it, they often become sharply acuminated; when opened, the matter that issues is in general highly offensive. The walls surrounding the abscess remain engorged and hard for some time after the evacuation of the pus. The fetor of the pus resembles that of fæces; a point which it is proper to mention, to guard against the inference that it might arise from a communication between the purulent collection, and the cavity of an intestine. In the early stage, the formation of the matter should be combated by vigorous antiphlogistic treatment; when formed, the matter should be let out as soon as fluctuation is discerned, to prevent the extensive separation of the layers of the abdominal walls.

*Wounds of Abdomen.*—This branch of the subject must also be reserved for another place (see Wounds); a few general observations only will be offered for the present, and merely with a view to illustrate the protective functions of the abdominal walls. We must again advert to the comparison of the cavities of the thorax and abdomen. In the former, the state of permanent extension, with the alternate limited contraction and dilatation of its parietes, renders the introduction of air into it inevitable, whenever a penetrating wound is inflicted upon it. In the latter, the reverse of this obtains: the balance of pressure and resistance between the walls and viscera is so well adjusted, the alternations of distension and collapse in the internal organs, are so accurately and constantly measured by the parietes, that no vacuum is permitted. Until the time of John Bell, surgeons entertained great apprehensions as to the effects of air admitted into the abdominal cavity; he exposed the fallacy on which this opinion was grounded, in his observations on Monro's work on the Bursæ Mucosæ. Cloquet has made experiments on animals, the results of which are confirmatory of the ideas of Bell on this subject. These apprehensions, however, should be set at rest, by what we observe in the incisions, and extensive manipulations of the intestines, in operations on the ovaries, in the Cæsarian section, eventrations, divisions of hernial sacs, &c. In a penetrating wound of the abdomen, the admission of air is all but impossible, as directly the wounding instrument is withdrawn, some portion of the moveable viscera instantly fills the aperture.

The exclusion of the air, or the mode in which it is effected, is indeed less a point of interest than the rapid glueing together of the wounded parts. This property of rapidly exhaling plastic lymph will be fully considered in reference to purulent collections in the article Abscess; at present we shall content ourselves by briefly alluding to it. The property of exhaling the elements of adhesion, in conjunction with the universal pressure of the viscera upon each other is such, that a weapon may pass through the cavity of the abdomen, wounding both blood vessels and intestines, and yet there may be no extravasation, either from the one source or the other. Hennen, in his Treatise on Military Surgery, relates the case of a soldier who recovered after a wound from a ramrod, the end of which stuck so fast in the spine, that considerable force was required in pulling it out. Before Bell's time it was supposed, that the weapon pushed the intestines aside, and passed without wounding them; but "we now know," says he, "that in a thrust across the abdomen, six turns of the intestine may be wounded; each wound may adhere; adhesion we know is begun in a few hours, and perfected in a few days, and when it is perfect, all danger of inflammation is over, and when the danger of inflammation is over, the patient may walk about." For more ample details on the agglutination of serous membranes, see Adhesion. Extensive wounds of the abdominal parietes give rise to large eviscerations, to which, although a cicatrix may be formed, the person remains liable ever after, the cicatrix being inextensible and weaker than the rest of the wall. In wounds that do not penetrate the cavity, it is impossible to determine, *à priori*, whether the case may be serious or otherwise; they may be followed by no symptom of importance, healing up in a few days without subjecting the patient to any inconvenience; or inflammation may arise and threaten to become extensive: they are often excessively painful, owing to the lesions of the nervous twigs with which the abdominal parietes are so plentifully supplied. It should be the surgeon's chief care to protect the patient against the occurrence of traumatic peritonitis, by the free use of antiphlogistic remedies, which should be carried as far as the patient's strength will justify. (See Wounds.)

*Contusions of the abdomen from blows, &c.*—These may interest the parietes alone, when they are termed simple; or they may affect one or more of the internal organs, when they are said to be complicated. The subject involves the consideration of the protection which the parietes afford to the contained organs. We have already alluded to this portion of the subject. The universal contact of the contained organs with the parietes, exposes them to the effect of external violence, more especially when it falls on the moveable walls. The peritoneum has been known to be completely divided by a blow, giving rise to a protrusion of the viscera, without a covering from this membrane. A cannon shot may impinge upon the surface of the abdomen, and reduce the intestines to a mass of pulp, without leaving any external trace whatever. Injuries like these are coincident with a relaxed condition of the abdominal walls; even the contents of a hernial sac have been ruptured by a blow, without leaving the slightest trace of injury in the integuments. Both the spleen and liver may be thus ruptured, and even the gall bladder, giving rise to a fatal extravasation of bile. The bladder and uterus can only be ruptured while in a state of distension. The stomach has also been ruptured, but the accident is very rare; rupture of the small intestines is not so unfrequent: the liability to this accident, *cæteris paribus*, will be relative to the degree of distension and density, as well as to the power of resistance of any given viscus. When the walls of the abdomen contract firmly, and prepare themselves, as it were for a blow, the protection to the internal parts may be effective. Some men are able to endure heavy blows on the abdomen, without shrinking, merely by throwing the recti muscles into strong contraction. Solutions of continuity may also occur in the muscles, or tendinous sheaths themselves, without any breach of the skin from blows, or from the efforts of straining in any way, such as coughing, vomiting, &c., more particularly, when the parietes are already thrown on the stretch from uterine gestation, ascites, tympanitis, or ovarian dropsy. They become sometimes morbidly fragile towards the end of typhoid fever, and are easily torn in the efforts which the patient may make during delirium. The abdominal organs are also liable to rupture from internal causes. Rostan has observed, the peritoneal coat of the intestines torn in some of the aged females at the Salpetrière, from constipation. Marjolin and Velpeau have seen the same effect produced by strictures of the intestines, on both the peritoneal and muscular coats. The simple contusions of this region are not attended with danger, and require no particular remark. (See WOUNDS, *contused.*)

*Effusions into the cavity of the abdomen.*—It has been already stated that the fulness of the abdominal cavity, and the pressure of the contained organs on each other have a powerful effect in checking effusion or extravasation, as they also undoubtedly have in limiting it when it has taken place. The fluid poured out, either slides into the nearest interstices of the convolutions, where it coagulates if it be blood, or if the quantity be considerable, forms a sheet in the neighbourhood of its source, and gradually works its way towards the opening in the parietes, if there be an external wound: it seldom yields to the effect of gravitation alone on account of the influence of other contravening causes. The matter extravasated may be blood, aliment, bile, chyme, pus, fæcal matter, urine, &c. When blood alone is effused, and in small quantity, the risk of life may be comparatively small, but when any of the other fluids are extravasated, life is quickly destroyed by rapid and violent peritonitis.

Fistulous openings are sometimes established in the walls of the abdomen, extending in the course of the cellular expansions, or communicating with the internal organs themselves, such as the stomach, gall-bladder, different portions of the intestines, &c., the fistulous tracks being carried completely into these viscera, by means of adhesions. (See FISTULÆ.)

The subject of protrusions of the contents of the abdominal cavity will be treated of under HERNIÆ. The general rules for exploring the viscera, are given in the article ABDOMEN, in the Cyclopædia of Practical Medicine. To the physical signs for the guidance of diagnosis there laid down, we shall add one which has been established by Dr. Bright, since the publication of that work. This sign is *a crepitation* which is felt under the fingers, and is indicative of abdominal or peritoneal adhesions. Dr. Bright states that it is only felt during a certain time, and is transitory. The symptom itself is of some importance in surgery, as it may guide and give confidence to the surgeon, in opening collections which tend outwards from the cavities, under the isolation of these adhesions, to be voided at the surface. In collections of matter in the liver, for instance, the surgeon should examine carefully and frequently, in order to detect this sign. Dr. Bright observes, "When the circumstances of the disease have rendered it probable that adhesions are established between the viscera, and the peritoneum of the parietes, the touch gives a peculiar sensation, varying between the crepitation of emphysema, and that which would be produced by squeezing new leather between the fingers." Dr. Bright has had numerous opportunities of satisfying himself of the correctness of this sign.

The anatomical and physiological considerations appertaining to the subject of Abdomen, will be found in fuller detail, in the article treating of it, in the Cyclopædia of Anatomy and Physiology.

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*( Bransby B. Cooper. )*

ABLACTATION, *ablactatio*, Lat., *weaning*, Eng.—Ablactation in the Latin language means *weaning*, and refers to the child. In medicine, however, the effects which are produced by the spontaneous or compulsory cessation of the secretion of milk deserve to be considered;—1. in reference to the mother; 2. in regard to the child. (See LACTATION.)

ABLATION, *ablatio*, L. from the verb *aufero*, to take away, which makes *ablatum* in the supine. In its general acceptation it expresses the separation, extraction, violent removal, or plucking away of any part that may be superfluous, inconvenient, hurtful, or foreign to the body. Hippocrates applied it to any sort of evacuation, the emission of blood for instance. In operative medicine it is used less to designate one of the various modes of *exeresis* than as a generic name for all forms of *amputation* and *extirpation*, which may be regarded as two species derived from it. Some surgeons employ the term in a more restricted sense, when they speak of the ablation of an exostosis, of a portion of carious or necrosed bone, &c. The ablation of parts is sometimes designated by particular words indicative of the manner in which it is effected, such as *excision*, *resection*, &c. or of the consequence of the ablation itself, such as *circumcision*, *castration*, &c.

W. B. C.

ABORTION (*obstetricy*), *abortus*, *aborsus*, *affluxio*, Lat. Διαφθορὰ, ἐκτρωσμὸς, Gr. *avortement*, Fr. *Fehlgeburt*, Ger. *aborto*, Ital. *aborto*, *malparto*, Span. *miscarriage*, Eng.

*Definition.*—The expulsion of an embryo or fœtus[1] from the uterus before the sixth month of gestation, at which period of existence it cannot survive to maturity, and is therefore generally considered non-viable[2].

The expulsion of a fœtus after the sixth month of uterine gestation is termed premature labour, as the phenomena and treatment of such cases are the same as in natural parturition, and as the infant may survive for some time.

From the time of Aristotle down to the last century, the expulsion of the ovum from the uterus before the seventh day has been often designated *effluxion*, and after this age and before the fortieth day, *abortion*. Bonaciolus held this opinion: "Effluxiones quæ intra diem septimam; aborsus quæ primis mensibus; abortus quæ intra quadragesimam[1]." These distinctions are, however, arbitrary and insignificant, and have been long disregarded.

Abortion or miscarriage may occur at any period of uterogestation, but it is much more frequent during the first two or three months. It is generally admitted, that at this time the slight connection between the embryo and the uterus, the increased afflux of blood to this organ from the moment of conception, and according to some authors, the hemorrhagic effort at the menstrual periods render women very liable to abort.

It is stated by some obstetricians, that the greatest number of abortive fœtuses is of the female sex, though the contrary is more generally supposed to be the case. Morgagni satisfactorily refuted the former opinion. According to him, the excessive development of the clitoris at the early age just mentioned, might be readily mistaken for the external male organ of generation.

Madame La Chapelle states, that of 21,960 pregnancies, there were 116 abortions, and these were more frequent at the sixth month than at the fifth, and next at the third, than at any other period of pregnancy. The more general opinion, however, is that abortion is of more frequent occurrence in the earlier stages of pregnancy. According to my own observations, abortion is most common from the second to the fifth month after conception.

M. Velpeau endeavours to reconcile these conflicting opinions, by stating, that abortion is productive of such little inconvenience in the first months of pregnancy, that many women were not admitted into the Maternity for that disease, or that the ovum or embryo was frequently confounded with sanguineous clots, which led patients to suppose they had only a return of menstruation.

*Causes.*—The causes of abortion are remote and proximate, or *efficient* and *determinant*. The efficient or proximate are the contractions of the uterus as in natural parturition, aided by the efforts of the abdominal and respiratory muscles. The remote or determinant causes may be subdivided into *predisposing* and *occasional*.

The predisposing causes may affect the woman or the fœtus respectively. As regards the woman, some belong to the organism in general, others to the sexual organs in particular; and as regards the fœtus, to a particular or anormal disposition of its organization, or to its diseases.

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[1] The term "embryo" is used in obstetricy to designate the impregnated ovum, during the first three months of intra-uterine existence; that of "fœtus" from that period to the end of gestation.

[2] There are, however, cases on record of infants born at the age of four months and half, which were said to have arrived at the adult period of life; and the parliament of Paris decreed that an infant born at the fifth month was capable of living the ordinary period of human existence. Fortsimons related a case of an infant born at five months and a half, which survived for some years; but the opinion of modern obstetricians is, that this fœtus was older. A large majority of physiologists and medico-legal authors agree in the conclusion, that infants born before the completion of the seventh month have a very slender chance of surviving; and many contend, on this ground, that no conviction for infanticide or concealment of pregnancy ought to take place in such cases. It is to be remembered, however, that the embryo is a living being from the instant of conception, and that abortions or premature deliveries are comparatively few in proportion to natural parturitions; and therefore that the existing law is humane and just. If the contrary opinion obtained, it might be as fairly argued that all feeble and delicate infants might be destroyed after birth, as was ordained by the laws of the ancient Spartans.

[1] De Formatione Fœtûs.

*Diseases of the Woman.*—The persons in general most predisposed to abort, are women of sanguine temperament and plethoric habit, in whom a determination of blood to the uterus and its appendages is well marked by excessive and irregular menstruation; women of high sensibility who have from any cause been greatly debilitated, or who have been addicted to masturbation in early life. A liability to abortion may arise also from constitutional vices, such as syphilis, cachexy, scrofula, &c. and finally from acute and chronic diseases, malformations of the spine or pelvis, tight-lacing, &c. Anterior miscarriages are amongst the most ordinary predisposing causes.

In regard to the genital organs themselves, rigidity of the fibres of the body of the uterus, and their resistance to its gradual and natural dilatation after conception; the too great sensibility and contractility, the thinness and laxity of this organ; the atony resulting from chronic leucorrhea, and severe parturitions, may be justly ranked amongst the causes of abortion. To these may be added inordinate heat in the womb, indicative of chronic metritis, displacements, deformities, adhesions, organic degenerescences of the uterus or its appendages, the presence of two or more fœtuses, producing a too rapid dilatation, and in fine, any disease in the parietes of the womb that prevents its natural development during pregnancy, or in the organs connected with it in function, as for instance neuralgia, or rheumatism of the ovaries. They often produce abortions which recur at the same period of successive pregnancies, and these are termed periodical by some authors.

Thus fibro-cartilaginous or other morbid alterations in the parietes of the uterus, or adhesion of this organ to any of the vicinal parts, will prevent its development during pregnancy, and excite it to expel its contents prematurely. In such cases abortion generally occurs at a certain period of uterine gestation; because the uterus will not suffer distention beyond a certain extent, as its organization is so deranged as not to admit of expansion without causing irritation and uterine contractions.

It was the opinion of Peu, and many other writers, that women affected with rachitism in an extreme degree, so as to implicate the pelvis, ought not to marry. But many women with some degree of spinal deformity have no pelvic contraction, and may bring forth offspring with perfect safety. I have been consulted in numerous cases of spinal deformity, as to the safety or propriety of individuals entering into the matrimonial state; and unless where the pelvis was so deformed that cephalotomy or gastro-hysterotomy would be required at the full term of uterine gestation, have not unfrequently decided that they might. It is true, however, when the deformity of the spine is considerable, the woman is very liable to miscarriage. In those cases in which one hip is much more elevated than the other, or in which one inferior extremity is longer than the other, accompanied by more or less spinal curvature, there is generally danger of abortion or premature labour, or difficult parturition at the full term of pregnancy. Women affected with profuse leucorrhœa, or atony of the uterus, are very much predisposed to abortion.

It was observed by Juncker[1], Stolz[2], and other writers, that corpulent women very often miscarry. It is also known, that in marshy and malarious countries, under certain constitutions of the weather, abortions have become epidemic, as mentioned by Hippocrates, and as noticed at Vienna in 1788-89[3]. I might quote numerous authors who have referred to the occurrence of epidemic abortions in different seasons. Thus they were observed after the humid heat in 1696; the dry heat of the years 10 and 11 of the French Republic[4], 1802-3; the mild and windy season of 1776[5]; the intense heat of 1811[6]; the mild winter of 1816[7]; and after the rainy season of 1821[8]. These records prove the correctness of the popular opinion, that abortions are more common in certain seasons than in others. Experience has also demonstrated that women who become pregnant at a very early, or at an advanced, period of life, are more exposed to abortion, than those who become mothers between the twentieth and fortieth year. It is a medical axiom, that women who marry too early or too late in life, generally purchase the pleasures of maternity at too dear a rate. The majority of those who are mothers between the age of twelve years and a half and fifteen are not sufficiently developed to bear the inconveniences of pregnancy; their general health becomes deranged, and their parturition and puerperality are often anormal. Those who become mothers from the age of twenty-eight or thirty to forty or forty-five have the muscles and ligaments connected with the outlet of the pelvis so rigid, that they suffer most severely, and frequently lose the first infant.

When this disease is excited by rigidity of the fibres of the uterus, it recurs at later periods in successive pregnancies, because the uterus expands to a greater extent during each pregnancy: but when abortion is caused by laxity or atony of the neck of the organ, this morbid state increases in each successive pregnancy, and the abortion happens earlier.

Among the causes of abortion or premature labour may be included, violent mental emotions, passions, longings, alarm or fright, dread of thunder, explosions of artillery, impression of strong or disagreeable odours, sight of disgusting objects, errors of diet, privation of sleep, rest, or food, abuse of stimulating food or drink, over exertion in walking, riding, dancing, running, jolting of carriages, raising or carrying heavy weights, frequenting crowded and heated assemblies, ball rooms, theatres, churches, &c., falls, slips, blows or wounds on the abdomen, violent coughing or laughter, the use of emetics or drastic purgatives, frequent sexual indulgence, surgical operations, even though slight, the extraction of a tooth, irritation or pain in the genital organs, or in any part of the body.

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[1] Petiot, *Thesis at Strasburg*, 1815.

[2] Deubel, *Thesis at Strasburg*, 1834.

[3] Stoll., *Ratio Med.* t. iii., 1789.

[4] Fick in Deubel.

[5] Rogny, *Annal. Clin. de Montp.* t. ix.

[6] Nægele in Deubel.

[7] *Fischer Herfeland's Journ.* t. 47.

[8] Osiander in Deubel, and many others.

Women in the lower class of life who are exposed to much bodily fatigue and mental emotions, are also very liable to this disease. The disposition to abortion is so strong in some women, that the slightest cause, either moral or physical, will induce it; while, in others, the strongest moral or physical influences will not excite it.

*Diseases of the Ovum.*—The predisposing causes of abortion which depend on the fœtus, are vices of conformation, or diseases of itself, or its appendages. When these cause the death of the fœtus, it becomes a foreign body in the uterus, which sooner or later expels it. It is easy to explain this result. The uterus from the moment of conception has an afflux, or determination of blood towards it, which continues during the whole period of pregnancy; but when the fœtus dies, the congested state of the uterus is no longer relieved by the passage of the blood to the infant for its nourishment; the latter is now a foreign body; and the former, in consequence of too large a quantity of blood in its substance, becomes irritated, its fibres are thrown into contraction, parturient action succeeds, and the uterus expels the dead fœtus and its appendages.

In all cases in which the embryo or fœtus is diseased or dead, abortion, or premature labour, as the case may be, must in general ensue; the instance in which gestation is continued to the full term, being the exception.

From these observations, it may be concluded, that abortion may be produced by any cause that enfeebles the mother or fœtus; the anormal conformation and diseases of the latter, the feeble or partial adhesion of the placenta to the surface of the uterus, its implantation over the neck of this organ, its scirrhous, hydatic, aneurismal, and varicose degenerescence, its smallness in proportion to the size of the fœtus; the shortness or excessive length of the umbilical cord, its twirlings round the neck, body, or extremities of the fœtus, its augmentation of volume by sacs, hydatids, tumours, knots, or adherences in it which oppose or prevent the circulation of the blood through it; the tenuity of the membranes of the ovum, a collection of fluid between the chorion and the amnios; too small or too great a quantity of the amniotic fluid, and numerous other diseases of the ovum: these last, according to Dr. Lee, are the most frequent causes of abortion. In most abortions, from the third to the sixth month of pregnancy, the ovum is not diseased, but is expelled through the influence of some of the accidental causes already enumerated. When the ovum is normal, it adheres to, or is strongly connected with the uterus; but when it is abnormal, the slightest shock or mental emotion may cause its expulsion. It is important to examine all ova, as they often appear healthful at first, but, on closer inspection, are often found diseased before the third month. Thus on careful investigation the membranes or embryo will frequently be discovered to be anormal.

*Occasional causes.*—The occasional causes of abortion are various. In fact there is not a circumstance in life which may not be followed by abortion. Amongst the causes already mentioned, and which we shall not here repeat, many are also occasional; but, strictly speaking, they include mental emotions, as joy, fear, anger, jealousy, &c.; diarrhœa, dysentery, colic, tenesmus, hemorrhoids, constipation, intestinal worms, strangury; the impression of odours, as the odour of a recently extinguished candle, &c.; asphyxia, violent hysteria; coition, especially if too often repeated; riding, dancing; falls or blows on any part of the body, but especially on the loins or abdomen; violent laughing, coughing, crying, vomiting, hiccup, sea-sickness, straining in evacuating the bowels or bladder; the use of strong purgatives, emetics, emmenagogues, abortives, hot-baths, pediluvia, copious depletion, especially from the feet, the convulsive motions of the fœtus, rupture of the umbilical cord or membranes, and adhesion of the fundus uteri to vicinal organs. It is generally thought that most of these causes act by separating the placenta, but this result does not immediately occur unless this organ is of a sufficient size to acquire, by the effect of a fall, blow, or concussion, as great a motion as that which is made on the uterus. The immediate separation of the placenta is recognized by the uterine hæmorrhage which instantly or speedily follows.

It is difficult to explain placental separation effected by the causes just assigned, when we remember that the ovum exactly fills the uterus, and that the ovum is exactly filled by the fluid of the amnios. We can clearly perceive, however, that the motions impressed on the woman are almost incapable of separating the placenta from the womb, or the chorion from the amnios, which are placed like two bladders, one within the other, and the inner one filled with fluid. It has also been long remarked, that the most active, laborious, and imprudent women, those who take unrestricted exercise, generally arrive at the full term of uterine gestation; whilst a vast number, in a state of affluence and ease, abort, in spite of the greatest care and attention. It is to be recollected, that women in the lower ranks of life, who make great exertion, and who are frequently exposed to falls and blows, very seldom miscarry. Many too have received the most severe injuries without having aborted. Mauriceau mentions the case of a woman who was seven months pregnant, whose fore arm was fractured, yet she went to the full period. Madame Lachapelle relates the case of a young midwife who was pregnant, and had a narrow pelvis; she precipitated herself into a deep pit, with a view of causing abortion, and avoiding the Cæsarean operation. She died in consequence of her wounds, but did not abort. A few years since, a young woman in the fourth month of pregnancy threw herself from the fourth floor of a house in Finsbury Square, and fell on the pavement; many of her bones were fractured—she survived a few hours, but did not miscarry. Numerous examples are given in works on forensic medicine of the difficulty of inducing criminal abortion by violent means, though the destruction of the life of the woman is a common consequence of such attempts.

According to the latest physiological observations on the placenta, this organ adheres to the uterus by means of the decidua, (Velpeau, Breschet, Lee, Radford, Ramsbotham, &c.) which is directly applied over the apertures of the uterine sinuses. If the circulation of the blood is increased throughout the system, or in the uterus by means of irritation in, or determination of blood, to that organ, the consequence will be, that the increased afflux of the sanguineous fluid in the uterine sinuses will separate the decidua over them to a greater or less extent, blood will be effused between the uterus and decidua, and the placenta will be partially or wholly detached from the uterus. If the decidua be lacerated, the blood will escape, in the early months, between it and the chorion, and in the latter months, between it and the amnios, or it will lacerate the latter and pass into its cavity; or the effused blood may find its way between the uterus and decidua, arrive at the uterine orifice, and escape through the vagina. It by no means follows, however, that in every case of abortion there is necessarily a separation of the placenta at the commencement; but when this does not happen, there must be detachment of some portion of the decidual membrane from the parietes of the uterus. Compression on the uterus, or a blow, may immediately produce separation of the placenta or rupture of the umbilical cord, or of the membranes enveloping the fœtus. But, in general, the occasional causes of abortion induce congestion in the vessels of the uterus, which is often succeeded by hemorrhage from separation of the placenta or decidual membrane, which excites uterine contractions, in consequence of the inconvenience or irritation to which the organ is subjected. Thus Klein has remarked that abortion is most frequent at the return of the menstrual periods. Some of the causes already enumerated excite spasmodic contractions, which are transmitted to the uterus by sympathy, and others act upon the fœtus itself. It often happens that a vivid mental emotion of the woman, is instantaneously followed by more or less motion of the fœtus, and even by its sudden death. I have known many women, in whose statements the fullest confidence might be placed, who declared that their infants ceased to move at a certain time. It is true, however, that the infant may be born alive in some cases in which the same declaration had been made. It is generally remarked, that abortives very rarely effect the object for which they are intended, while they often destroy both mother and fœtus. Many such cases are recorded in the works on Medical Jurisprudence. "I have," says M. Désormeaux, "been consulted many times for acute and chronic metritis, severe metrorrhagia, and cancers of the uterus, which were caused by the criminal means employed to procure abortion."—*Dict. de Med.* The induction of criminal abortion is felony, and is never resorted to by respectable medical practitioners, except in cases of irreducible retroversion of the uterus, and certain diseases of this organ and the ovaries, as in these diseases the women will lose their lives, unless the uterine contents are expelled. It is, I believe, the opinion of medical practitioners in all nations, that the induction of abortion is perfectly justifiable in such cases. Dr. Ashwell's paper on the Induction of Premature Labour in cases of disease of the ovary, when rapidly advancing in consequence of the determination of blood to the uterus, may be referred to with advantage.—*Guy's Hospital Reports, No.* 2, *April*, 1836. It would, however, be better in such cases to avoid pregnancy, and that the parties should live separately.

Many authors, since the time of Aristotle, defend moderate sexual intimacy during pregnancy, among whom are Mauriceau and Dionis. "For myself," says this last writer, "I have had a wife who has been twenty times pregnant, and brought me twenty infants, of which she was happily delivered at the full period of pregnancy, and I am persuaded that the caresses of a husband are not injurious[1]." This is true as a general proposition; but I have been consulted in many cases in which abortion and premature labour were excited by frequent or excessive nuptial enjoyment. While writing this article, I was called to a case of abortion between the second and third month, induced by this cause. Every one has observed, that most of the mammiferous animals refuse copulation after conception; but physiologists admit that a moderate use of it does not appear to be injurious during human pregnancy. Aristotle even supposed that towards the end of gestation it was a means of facilitating parturition. There appears to be some reason in this remark, as I have known parturitions occur two and three weeks before the expected time, which were said to have been induced by conjugal embraces. In fine, a moderate use of this function is not injurious during pregnancy, though it should be avoided when abortion is feared or threatened.

> "Pour conserver le fruit de vos chastes plaisirs,
> Réprimez désormais vos amoureux désirs.
> Au feu qui vit en vous un autre feu peut nuire,
> Et ce qu'Amour a fait, Amour peut le détruire."
> *Tillet, Dolley's Thesis*, 1826.

There are, moreover, special causes which favour the occurrence of abortion: irritative congestion of the uterus, as Désormeaux remarks, occurring at the return of the menstrual period deserves particular notice under this head. During the prevalence of cholera in Paris in 1832, abortion, from the death of the fœtus was of frequent occurrence. Habit is also not unfrequently a cause of abortion. Thus it is observed to occur at the same period of pregnancy in the same woman, ten or twenty times consecutively, without any other influence apparent in its production, than that of the *molimen hæmorrhagicum*, or debility. In these instances, the health of the woman suffers, and the prospect of a family is not unfrequently destroyed.

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[1] *Traité Général des Accouchemens, &c.*

There are some women who never arrive at the full time, and others who seem to have an hereditary tendency to abortion. It has been said, that there may be a congenital state of the uterus which prevents it from enlarging to the proper extent during pregnancy, and that the irritation produced by the fœtus will cause abortion. Schluz speaks of a lady who aborted twenty-two times at the third month[1]. Stoltz knew two women each of whom had aborted seven times[2]. I have known three similar examples. Schurigius attended a woman who aborted, or rather had a premature labour, at the eighth month after her second parturition, and did not arrive at the full term until her twelfth accouchement[3]. Burton mentions the case of a woman who had aborted eight times at the third month, and who was led by means of small bleedings to the full term with her ninth conception[4]. I have known a patient who aborted five times in fifteen months from her marriage, at the expiration of which period she died of phthisis. M. Velpeau cites many similar cases of abortion, and mentions one of a young woman who procured the expulsion of the ovum by criminal means several times, and who, after marriage, could never be brought to the natural term of utero-gestation.

Abortion is also caused by certain mechanical operations in cases of deformed pelvis, where premature labour is required, when a full-grown infant could not be born at the termination of utero-gestation. Criminal abortion is often attempted in large cities and populous towns, and generally destroys the woman by peritonitis or metritis. Cases have occurred in which sharp instruments were passed into the substance of the womb, producing fatal hysteritis and peritonitis. M. Velpeau attended a woman who had profuse hæmorrhage caused by attempts of the same kind. She suffered most excruciating pain in the pelvis for two months; abortion did not take place, but a large ulcer of the neck of the womb was produced. Girard of Lyons cites an analogous case, in which the sufferings of the unfortunate patient were so great that she committed suicide[5]. M. Velpeau states, that criminal abortion is very common in Paris, and that he had been called to four cases in two months. One woman died of peritonitis, another was affected with cancer, the third with hæmorrhage which could not be arrested, and the fourth was finally cured.

*Signs of Abortion.*—The phenomena of abortion will vary according to the period of pregnancy at which it occurs, and the nature of the cause which produces it. In the first two months of pregnancy, it often happens that the ovum which is of a small size is expelled entire without pain or hæmorrhage. This happens in lax habits, in whom the orifice of the womb is soft, flaccid, and very dilatable. In most cases, however, there are pains, accompanied by more or less hæmorrhage, with clots in which the ovum is enveloped and often escapes unobserved. This occurs when the membranes rupture, and the fœtus escapes detached from the placenta. In such cases, women frequently suppose they had a catamenial obstruction, and that the painful discharge is only menstrual: but the menstrual fluid does not coagulate in its normal state, unless blood is effused with it during the congested state of the uterus,—termed the menstrual molimen,—which precedes and accompanies the uterine evacuation.

In proportion as pregnancy is advanced, the size of the fœtus will be augmented, the pains and hæmorrhage which accompany abortions will be more and more considerable; and it has been long remarked, that this hæmorrhage is much more profuse, than that which accompanies natural labour at the termination of pregnancy. It is on this account that abortions are much more injurious to health than natural labours, at the full term of utero-gestation. It is also well known that a woman who has had six or eight abortions, accompanied by profuse hæmorrhage, will have much worse health than another who has had as many natural labours, at the full time. In fact, the hæmorrhage has been so great in many cases, as to destroy life, and in some recent cases, transfusion alone could preserve it. Mr. Ingleby relates a case in which six quarts of blood were lost; and Mr. Mainwright, of Liverpool, lately saved a woman by transfusion.

When abortion is produced by chronic diseases or causes that act gradually, it is generally accompanied by the following symptoms: horripilations, or rigors, succeeded by heat of skin, thirst, nausea, loss of appetite, pains in the loins, lassitude, lipothymia, palpitations, frequent pulse, coldness of the extremities, depression of spirits, sadness, pallor, tumefaction or lividity of the eyelids, loss of brilliancy of the eyes, fetidity of the breath; sense of sinking, and feebleness in the abdomen, of cold about the pubis, of weight about the vulva and anus; diminution and flaccidity of the mammæ, the nipples sometimes discharging a serosity; evacuation of a sanguineous or sanious fluid from the vagina, sometimes grumous and coagulated; decrease of the motions of the fœtus, which finally cease; sinking of the hypogastric region, or sense of coldness under the pubis; uterine pains, more or less acute and frequent; progressive dilatation of the uterine orifice, and periodical pains as in natural parturition; more or less hæmorrhage, prominence of the membranes; in fine, the expulsion of the fluid of the amnios, next of the fœtus, and lastly, after a longer or shorter period, of the placenta and membranes. The hæmorrhage seldom ceases in general before the expulsion of the placenta and membranes. As soon as the membranes rupture, the progress of pregnancy is arrested, and abortion is inevitable. Some suppose that the amniotic fluid may be discharged many weeks or even months previous to parturition, and that during labour, the membranes may present as usual, rupture, and again discharge their fluid. But such cases are examples of disease in which a greater or less quantity of fluid is secreted and accumulated between the amnios and the chorion, and finally escapes through the vagina, the amnios remaining unbroken until the time of parturition. Several pints of fluid have been collected and discharged from the uterus in such cases, while the amnios remained unbroken. It is almost universally admitted that when the amnios is ruptured, abortion, premature labour, or parturition at the full time are inevitable. I have known, on the other hand, watery discharges from the uterus in different quantities from the third to the end of the ninth month of pregnancy.

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[1] Lacroix, Thes., 1812.

[2] Deubel, Thes., 1834.

[3] Section 4. c. 1.

[4] Art of Midwifery.

[5] Journ. Gen., t. iv.

*Pathology of Abortion.*—When abortion follows the powerful occasional causes, it is sometimes preceded by pains and sense of weight in the loins, and sometimes in the vagina, and of general indisposition, accompanied by the symptoms already enumerated.

There is, at first, a slight serous or watery discharge from the vagina, which is speedily succeeded by a greater or less effusion of blood, or by copious hæmorrhage. In other cases there will be a profuse hæmorrhage from the commencement of the attack, until the fœtus and its appendages are expelled. This symptom generally happens in those who have suffered from previous abortions, or are plethoric or delicate. The pains may be slight or severe, and extend from the umbilicus to the uterus and vagina; parturient action supervenes, and the fœtus is expelled.

The quantity of blood discharged varies considerably: sometimes there is very little, at other times a jet, current, or several coagula, according as the separation of the ovum is more or less extensive, or as it may be more or less remote from the os uteri.

In fine, the symptoms of abortion resemble those of parturition in proportion as pregnancy is advanced. This is also the fact as regards the lochial evacuation and the secretion of milk.

In the early months of pregnancy, the embryo is often expelled, while the placenta with the membranes are retained for days or weeks afterwards. As long as the secundines continue in the uterus, there will be more or less hæmorrhage, and in some cases, this will be periodical. In all cases of abortion during the first three months, we should not take it for granted, on the statement of the patient or nurse, that the placenta has been expelled, as well as the conception, unless we have ocular demonstration of the fact. Women often mistake clots of blood for the placenta, and frequently remove them before the arrival of the surgeon. I have known cases in which the placenta was retained for three, five, and six weeks after the expulsion of the embryo; hæmorrhage was considerable, the nurse positively asserting that the after-birth had passed though it was still in the uterus.

It sometimes happens that the ovum is expelled entire, especially about the end of the second month. At a later period its volume does not allow it to be so completely detached, more especially when the pregnancy is more advanced. The entire ovum has been expelled at the fourth, fifth, and sixth months, (Diembroeck, Velpeau, Eryaud, Stoltz, Siebold, Marson, &c.) though it often happens that the placenta remains in the uterus. In the first months, the ovum may escape, covered with the amnios only, the caduca, chorion, and placenta remaining in the uterus. (Velpeau, Ricord, Guillon, Lemercier, &c.)

About the middle period of utero-gestation, the fœtus may be expelled enveloped in its membranes, with or without the placenta. Such cases are by no means of rare occurrence. It also happens in the early months of pregnancy, that the membranes may rupture, and the amniotic fluid escape; the embryo, placenta, and membranes become decomposed, and are evacuated as a brownish fetid sanies. At other times, the placenta continues attached to the uterus, increases in size, and gradually assumes a fleshy appearance, in which we occasionally find hydatids. The fœtus may be expelled, or remain in the liquor amnii, which may macerate it, and render it almost gelatinous. The degenerescence of the placenta is termed a mole. When pregnancy is somewhat advanced, the fœtus may be born alive; but if younger than the sixth month, is not viable, as it only survives for a few minutes or hours in a great majority of cases.

In some instances, the fœtus remains in the uterus until the end of pregnancy, when it is expelled in a state of *ramollissement* and maceration, without any signs of putrefaction, more especially in those cases where the membranes being unbroken, the access of the air is excluded. In some abortions, the fœtus is converted into a substance resembling adipocire, or it acquires the hardness of stone, and may remain in the uterus till the death of the mother. In others, after an indefinite lapse of time, the uterus inflames and suppurates, an abscess forms, and opens on the anterior wall of the abdomen, or into the intestines or vagina, giving issue to the pus and sanies formed by the decomposition of the flesh and organs of the fœtus, during putrefaction.

In general, however, when the fœtus is dead, it is speedily expelled from the uterus. But it has been known to remain during twenty-eight days, in the case of a woman who was seven months pregnant (Velpeau), and M. Prout informed this author of a case of a fœtus between three and four months which was retained for five months after the commencement of the abortion. When the fœtus dies at the sixth, seventh, or eighth month, which often occurs in women tainted with syphilis, it is generally expelled between the seventh and eighth month; and when it dies from other causes, it may be retained until the ninth month, and in some cases for years. In such cases, the fœtus may escape entire, or in parts. It may be expelled when blighted, while a living infant may sojourn in the uterus, and be born alive at the full term of pregnancy. The records of obstetricy contain many such examples; other cases are also mentioned in which the blighted fœtus was retained, and born with the living one.

Dr. Blundell states that when the fœtus is blighted in the early months, it may be retained until the term of pregnancy.

After the death of the fœtus, the circulation between it and the mother ceases, and the uterine hæmorrhage is seldom fatal. When the fœtus is dead, or the placenta decomposed, there will be a fetid discharge, accompanied by nervousness and more or less constitutional irritation; but these symptoms are sometimes absent. They are, however, urgent in most abortions from the first to the third month of pregnancy, and require sedatives, tonics, and nourishing diet, in addition to the local and general means recommended hereafter.

M. Ansiaux speaks of a fœtus that died at the fourth month, and was not expelled until the end of pregnancy[1]. Ozanam described a fœtus converted into an irregular mass which weighed six pounds[2]. Huzard has observed the same in ewes, and Carus established that the fœtus may be absorbed, decomposed, or covered with a calcareous crust[3]. He mentions a woman who was in irregular labour in 1814, and was still pregnant in 1820. The fœtus remained fifty years in the uterus of another of his patients[4]. Lieutaud relates several examples of the fœtus having remained in the womb for twenty, thirty, and forty years. Recent writers have mentioned cases of retention of the fœtus for a shorter period. M. Velpeau saw a woman in April, 1834, with M. Vasseur, whose fœtus had remained since the autumn of 1833 without any serious inconvenience, and he observed another with MM. Puzin and Moreau in which the woman died at the end of the third month, and the fœtus was unaltered. Barbaut describes the case of a fœtus which died about the fourth month, and was not expelled before the eighth[1], and another which died at the same age, and was not thrown off until the ninth month. In both cases the membranes were thick and tough, and contained but little fluid.

Cases of early abortion of the second and third month have fallen under my own observation, in which the placenta was retained from one to twelve weeks after the expulsion of the fœtus, and without having been much altered. It is also said that the membranes may be developed, and that the decidua may become thickened. In such cases, the amnios is said to disappear, the cavity of the chorion becomes gradually thickened, and assumes the form of a solid fleshy mass, in the centre of which is a cavity generally containing a serous fluid. The placenta may continue to increase, or may be infiltrated; and when expelled, it may possess none of its primitive characters.

The alterations of the ovum, according to M. Velpeau and Dr. Granville, are numerous and cannot be easily discovered. They usually form moles, and their appearances are so diversified that it would occupy a large volume to describe them.

MM. Velpeau and Breschet have also given illustrations of multiform abortions in their respective works on human ovology. I may observe, that in my opinion, the different products elucidated in the first ten plates of Dr. Granville's work were evidently morbid; the same has been stated lately respecting those of M. Velpeau, before the Academy of Sciences by M. Coste and Dr. Alexander Thomson. (*Gazette Médicale, Journ. Hebd., &c., Oct.* 1835.)

It often happens that the fœtus and its appendages are expelled entire. I have known examples at every period of utero-gestation, from the first to the sixth month, and the same thing occurs from the sixth to the ninth month.

The expulsion of the entire ovum occurs most frequently at the end of the second month. M. Velpeau has observed one case in which the fœtus was expelled covered with the membranes at the sixth; and I have also met with a similar example. Diembroeck is of opinion that it may occur at the full period of utero-gestation, and I have been informed of two examples. (*Anat. du Corps Hum.*, t. i.) Baron Larrey sent M. Velpeau a fœtus thus enveloped at the fifth month and a half; and M. Eryaud reports a similar one. (*Thesis, Paris*, 1831.) M. Stoltz has seen a case at five months. (*Deubel. Thesis at Strasburg. April*, 1834.) Marson has met with an example at the eighth month. (*Deubel, op. cit.*) MM. Velpeau and Ricord have seen several in the first months of pregnancy, in which the ova were expelled covered by the amnios alone. (*Traité Complet d'Accouchemens, &c.*, 1835.) It generally happens, however, in the early months of pregnancy, that the ovum is expelled covered with the membranes, but the placenta remains behind and gives rise to tedious and sometimes fatal hæmorrhage. In some of these cases, transfusion alone can preserve life. I may here remark, that the great difficulty in treating abortions during the first six months of pregnancy arises from the impracticability of any manual operation, for the removal of the placenta. In such cases, the secale cornutum will often excite the uterus and cause it to expel the placenta. If this medicine fail, the vagina ought to be plugged tightly, and by this means the hæmorrhage will be arrested. When there is great prostration of the vital powers, nutritious aliment and cordials will be necessary. Mr. Ingleby relates three cases of abortion at the second month, and one at the fourth month, in which the hæmorrhage proved fatal. In one of the three, the patient died before any part of the ovum was expelled from the uterus. Another died from hæmorrhage at the seventh day after the expulsion of the ovum. In the case at the fourth month, the fœtus was expelled, but the placenta did not separate. He correctly remarks, that such fatal results are unusual at those early periods. (*Treatise on Uterine Hæmorrhage*, 1832.) A lady of title died lately of hæmorrhage in the early months.

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[1] Clin. Chir., 1829.

[2] Compte rendu des hospitaux de Lyons, 1823.

[3] Zur Lehre von Schwangerschaft und Geburt Phys., Leipzig, 1822.

[4] Bull. de la Faculté.

[1] Cours d'Acconchemens, &c.

*Prognosis of Abortion.*—Hippocrates observed that abortion, or premature labour, was more dangerous than natural parturition. The first is a disease, the second the performance of a natural function. It does not, however, always follow, that abortions are dangerous. Much will depend upon the period at which they occur, on the causes which produce them, and on the symptoms and diseases which accompany them. As a general proposition, it may be stated, that the earlier the abortion, the greater the danger to the woman, more especially between the second and fifth month of pregnancy, the hæmorrhage is more abundant, and the fœtus and its appendages are expelled with more difficulty than from the fifth to the end of the ninth month. In the former cases, the uterus is not sufficiently developed to admit the introduction of the hand to extract the placenta. Nevertheless, there are some eminent obstetricians who maintain, that the danger is greatest in proportion as the pregnancy is more advanced. (Désormeau, *Dict. de Med.*, Art. AVORTEMENT. Velpeau, *Traité Complet d'Acch.* Copland, *Dictionary of Practical Medicine, &c.*) It is also a received opinion, that abortion produced by accidental causes, is more dangerous than when it is effected by predisposing causes, and especially when the cause acts with violence and suddenness on a woman who is not predisposed. Again, abortion is most dangerous when provoked by medicines or mechanical means. In such cases, the woman is generally destroyed by hæmorrhage, metritis, enteritis, or peritonitis. When abortion occurs spontaneously, and without any evident cause, or from diseases of the ovum, it is accomplished with little pain or difficulty, and may not be followed by any unfavourable symptoms; but it is very liable to recur; and frequent recurrences are succeeded by numerous diseases, such as deranged menstruation, chronic metritis, organic diseases of the uterus, leucorrhœa, hysteria, dyspepsia, cachexia, phthisis, and lesions of organs already predisposed to disease. The chief sources of danger, however, in connexion with abortion, are the hæmorrhage that accompanies it, the prostration of strength which follows it, and the diseases which are excited in predisposed organs. When abortion is accompanied by convulsions, or when it occurs during the progress of fever, small-pox, scarlatina, measles, erysipelas, or visceral inflammation, the prognosis is very unfavourable; and the woman frequently dies. When it is excited by mechanical means, it may be succeeded by inflammation of the uterus, which will endanger the life of the woman, or cause adhesions between the parietes of the uterus and the fimbriated extremities of the uterine tubes, and thus induce incurable sterility; or gangrene may ensue, and cause death. A few years since, a healthy young woman, in the third month of pregnancy, had a tumour removed from her breast in St. Bartholomew's Hospital. She aborted immediately after the operation, and died on the following day of peritonitis. It has long been received as an axiom in obstetrics, that surgical operations ought not to be performed during pregnancy or lactation, unless for some disease which threatens the immediate destruction of life.

When the neck of the uterus is soft and relaxed, while the rest of the organ preserves its normal density, abortion takes place more readily, and with less danger than in the contrary condition of the parts. If it is produced by a well-marked *molimen*, and without any morbid complications, it may terminate as favourably as natural parturition; but it is to be remembered that this hæmorrhagic effort is often the first stage of inflammation, and when attended with fever, we have to fear metritis or peritonitis: if they should arise, the prognosis, as already stated, is very unfavourable.

Some authors (James and Mauriceau) consider abortion beneficial to health, by establishing the regularity of menstruation, and inducing fecundity. Hippocrates himself was of opinion, that if it occurred sixty days after conception in a woman whose menstruation had been usually deranged, the evacuation would become regular. Mauriceau stated, that women who had been sterile for many years, in consequence of suppressed menstruation, became fecund after abortion. But the occurrence of abortion in such a case was positive proof that the woman was not sterile. There is, perhaps, but one case in which abortion is favourable to reproduction; and that is, when the cavity of the uterus is too small, and the tissue of the organ too dense, to allow sufficient dilatation of the former, for the developement of the ovum. In such a case, the first abortion would diminish the anormal rigidity; the second, third, or fourth, would expand the organ more and more, or completely overcome its resistance, and at length natural parturition would be effected.

*Treatment.*—The indications of treatment are to prevent abortion; and when that cannot be accomplished, to combat the unfavourable symptoms which accompany it, and to obviate the accidents that may succeed it. The preventive treatment embraces the following indications:—to remove the predisposing causes; to repress morbid action; and to avert the occasional causes.

The principal predisposing causes are errors relative to the rules of hygiene; the influence of temperament; plethora; disposition to hæmorrhage, and excessive menstruation; hereditary disposition; organic diseases of the uterus; and implantation of the placenta over the neck of the organ, which cannot be prevented by any plan of treatment; to which may be added, the diseases of the ovum and its appendages.

When there is excess of rigidity of the uterine fibres, or of contractility or sensibility of the whole organ, refrigerant drinks, venesection, warm baths, and emollient vaginal injections, with anodynes, are required. In the opposite conditions of the uterus, when there is feebleness and laxity of the fibres of its neck, and atony of the organ; tonics, nutritive aliment, cold bathing, either simple or saline, and astringent vaginal injections are indicated. The best time for treating both states of the uterus is during the intervals between the pregnancies.

When abortion is threatened in consequence of uterine congestion, tranquillity of mind and quietude of body ought also to be strictly enjoined. The apartment should be large, cheerful, and airy; the bed clothes light; bed curtains and fire should be removed in warm weather; the diet ought to be light, nutritious, and digestible, consisting of the vegetable jellies, such as arrow root, sago, &c.; the drink should be cool, as lemonade, barley water, imperial, toast water, &c.

This plan ought to be persevered in by those who have had former abortions, for several days, as the slightest deviation from it will induce the disease with which they are threatened.

There is much diversity of opinion as to the use of aperients in threatened abortion. Denman, Croft, and others, preferred allowing the bowels to be confined for two or three days; they considered that laxatives, by exciting them, would also irritate the uterus, and increase the danger of abortion. I have long followed this rule in practice. I have first tranquillized the uterine pains with sedatives; and when they had ceased, administered castor oil with fifteen or twenty drops of the sedative or common tincture of opium. Indeed, the lancet or opium employed as soon as possible, with rest, and the remedies already enumerated, will in most cases prevent abortion. I have generally found the opium succeed; and I should not defer giving it until bed-time, as recommended by a late writer.

When the contractions of the uterus are spasmodic or convulsive; antispasmodics, sedatives, warm baths, and fomentations, generally afford relief.

The treatment of abortion may be divided into preventive, palliative, and active.

The preventive treatment must vary according to the exciting causes, which are to be combated or removed.

In full habits, blood-letting, in small and repeated quantities, is one of the best means of preventing abortion; Dionis advised it to be performed eight days before the second menstrual period[1]. It was the principal remedy employed during the epidemic abortions which prevailed at Vienna in 1778-9[2]. But it would be wrong to conclude with the vulgar, that venesection is necessary in all cases of pregnancy, and in all abortions. Obstetric writers advise it in threatened abortions, when women are robust and plethoric, but all condemn it when the constitution is enfeebled or delicate. In the latter cases, nutritious aliment and tonic medicines, such as cinchona, quinine, rhatany, &c. with a liberal use of wine, especially claret, and cold bathing, are recommended by Dr. Denman and others. Plethoric women often abort several successive times, between the second and third month of pregnancy; but they may be conducted to the full term of gestation by repeated venesection at the recurrence of the menstrual periods, absolute rest, opiates, cold hip bath, or sponging the lower part of the abdomen, hips, and thighs, with vinegar, and cold water, and cold vaginal injections are sometimes beneficial. In most cases of threatened abortion, absolute repose on a mattrass or couch, and the exhibition of a full dose of morphia, or the sedative solution of opium, to allay uterine action, will prevent it. But when there is no hope of prevention, the degree of pain indicating the degree of action of the uterus, and such action favouring and producing the contractile power of the blood-vessels, the employment of opiates is contra-indicated, as it would tend to continue the hæmorrhage. It is scarcely necessary to observe, that the erect position, standing or walking, &c. cause the descent of the uterus in the pelvis, excite its action, and provoke abortion or premature labour. Opiates are also proper at the recurrence of the menstrual periods in irritable, nervous women, and when there is disorder or irritation in the bladder or rectum. Mr. Ingleby relates some instructive cases, in which he prevented abortion by the use of opiate suppositories. In one case the patient had aborted eight successive times; and in another, where premature labour was threatened, at the sixth month, he employed a scruple of opium in grain doses, and succeeded in conducting the pregnancy to its termination. He also strongly insists on the necessity of conjugal separation during the first five months of utero-gestation. This last opinion is also judicious in all cases of threatened abortion; and the non-observance of it is a frequent cause of this accident, as I have already stated. Hæmorrhage must be arrested as speedily as possible, as it weakens the woman, diminishes uterine energy, often destroys the fœtus, and frequently ends in abortion. This is effected by the contraction of the coats of the blood-vessels, or by the formation of coagula. Syncope, which often alarms unnecessarily, arrests the rapidity of the circulation, and favours the formation of coagula. Dr. Denman observes, on this point—"Cordials are not, therefore, to be hastily given to those who faint from loss of blood; unless the faintness should continue so long as to make us apprehensive for the immediate safety of the patient[1]." It is important to remember that, in abortion, there is a separation of the decidua, or chorion, from the uterus, and an effusion of blood, of greater or less extent, between the separated parts, or between the chorion and amnios, or into the cavity of the amnios. The separation between the decidua and uterus is perhaps most frequent near the neck of the organ, on account of its dependent position; but it may occur at any part of the uterine cavity. (Boudeloque[2].) If the blood escapes from any part of the superior portion of the uterine cavity, it cannot readily pass through the orifice of the uterus; it acts as a foreign body, excites irritation and contraction of the womb, by which it is finally expelled.

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[1] *Traité des Accouchemens.*

[2] *Stoll. Rat. Med.*

Astringent medicines, and those which diminish the action of the heart, such as digitalis, colchicum, tartarized antimony, hydrocyanic acid, &c., are administered with a view to arrest uterine hæmorrhage. Remedies of the latter class are, however, of doubtful efficacy in cases of abortion. Digitalis has been recommended in drachm doses by high authority, but I believe it is seldom, if ever, prescribed at present in such quantities. Astringents are, in general, preferred after venesection, and the infusion of roses, with an additional quantity of sulphuric acid, is an old remedy, very much employed by a great number of practitioners, but, according to my experience, it is a very inefficient or rather useless medicine. I agree with Dr. Blundell, "it is an excellent remedy when the battle is won." The same remark applies to catechu, kino, sulphate of alumen, &c. I cannot agree, however, with Dr. Denman, that astringents "have no power in stopping hæmorrhages from the uterus[3]." I have repeatedly observed the greatest success follow the employment of the acetate of lead, dilute acetic acid, and the sedative solution of opium, with distilled water; but in much larger doses than those advised in works on materia medica. (℞ Plumbi acetatis gr. vi—xx; Acidi acetici dil. ʒi—ij; Aquæ destillatæ ℥iij—ij; Liq. opii sedativi ʒss—ʒj; Syrupi simplicis ℥j. M. Dosis sem-uncia singulis, secundis, vel tertiis horis.) When this medicine is rejected by the stomach, Dr. Dewees orders it to be injected into the rectum, in the proportion of twenty grains, with a drachm of laudanum, and three ounces of water.—*American Cyclopædia.* The dilute sulphuric acid, combined with digitalis and colchicum, is often highly useful. I have also repeatedly found nauseating doses of tartarized antimony arrest hæmorrhage, when all other means had failed. The tinct. ferri muriatis is also a powerful astringent, and may be employed in the absence of uterine congestion. The powder of secale cornutum with an aromatic, in doses of three grains, every second or third hour, is a remedy capable of arresting uterine hæmorrhage, when slight, and also menorrhagia and leucorrhœa. Tannin, in the dose of a grain or two, in a pill, in the second hour, is strongly advised by some foreign authors.

In addition to all the means mentioned in the preceding remarks, the tampon, or plug, is a most efficient auxiliary. Notwithstanding the strong recommendations of the French, German, Italian, and American obstetricians, I regret to state that it is too seldom applied in Great Britain and Ireland, even at the present period. It is a remarkable circumstance, that a remedy advised by Hippocrates, Moschion, Paulus Ægineta, Hoffman, Leroux, Désormeaux, Lachapelle, Capuron, Gardien, Velpeau, and many others on the continent of Europe; and in this country, by Smellie, Denman, Hamilton, Burns, Ingleby, and many others; and by Dewees and the American obstetricians,—is by no means so generally employed as it ought to be in the British dominions. The use of the tampon or plug is, however, highly beneficial in abortion. The scientific reader is aware that the uterus, in the second, third, and fourth months of gravidity, is firm and undilatable in its tissue, and comparatively small in its cavity; and that it offers unconquerable resistance to sudden dilatation at these periods of pregnancy. It therefore follows, that when pressure is made on the uterine orifice, by means of the tampon or plug, of lint, charpie, muslin, or other soft material, and the vagina firmly plugged, very little blood can be effused into the comparatively small cavity of the uterus, from the second to the fourth or fifth month of pregnancy. But the dilatability of the uterus is considerably increased after the fifth or sixth month of pregnancy, and still the plug may be employed, though the hæmorrhage will be more profuse. It need scarcely be observed, that from the seventh to the ninth month, the dilatability of the womb is so great, and its cavity so large, that the remedy under consideration is of doubtful efficacy, and, in my opinion, ought not to be employed, as it may prevent the escape of blood externally, which may accumulate in the uterus to a dangerous or fatal extent. As a general proposition, I think it may be maintained, with Leroux, that the tampon or plug is a most valuable remedy during the first five months of pregnancy. The mode of applying it is as follows :—The obstetrician moistens several small pieces of lint, calico, muslin, charpie, old silk handkerchief, or some other soft cloth, with vinegar and water, or a weak solution of alumen; he then squeezes, and oils them, and introduces them one by one against the os uteri. He continues to introduce them until the vagina is impacted, and pressure made against the orifice of the womb, which prevents the escape of blood, favours coagulation, and stops the hæmorrhage. It is essential to fill the vagina completely, for if the plug be loose or too small, the hæmorrhage will continue. It also often happens, that the vagina, in those who have had offspring, dilates in a few hours after the introduction of the plug, and the hæmorrhage returns. In such cases an additional quantity of lint, or soft cloth, ought to be introduced. When the urethra is firmly compressed, there may be retention of urine, and it will be necessary to remove one or more of the last pieces of lint that have been applied, which can be easily effected by the surgeon or the patient, without disturbing the rest of the plug, or the coagula formed between it and the orifice of the womb.

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[1] *Denman's Obstetrician's Vademecum, &c., edited by M. Ryan*, M. D., 1835.

[2] *Traité des Hémorrhagies Utérines, &c.*, 1834.

[3] Obstetrician's Vademecum, 1835, p. 158.

It is not easy to determine the exact quantity of lint which is required to plug the vagina, which varies in dimensions, and is very dilatable, especially in married women. The rule is to fill it completely; and, should it dilate, and the plug become loosened, to introduce an additional quantity of lint. In some cases, the constrictor vaginæ closes the external genital fissure, though the vagina is very capacious behind this part, and renders it difficult to use the plug. In such cases, the practitioner ought to persevere until he has accomplished the object he has in view. I have met with examples of this kind, in which an hour was employed in applying the plug efficiently. In these instances, and when the vagina is narrow and undilatable, as in women who have not borne offspring, it will be difficult, and often impracticable, to introduce a large piece of cloth, or of sponge, as advised by some writers. The sponge will rarely make sufficient pressure against the uterine orifice to arrest the hæmorrhage, and is often removed with difficulty. It is scarcely necessary to observe, that it ought to be wetted, oiled, and firmly compressed on being introduced into the vagina. In some cases, three or four large pieces will be required to fill the vagina, and make sufficient pressure on the os uteri. The majority of women have a great objection to the operation, and, under such circumstance, its real object ought to be explained; as also the fact, that the substance about to be introduced, cannot pass into the womb, bladder, or bowel; in fine, that it is only to be placed in the passage through which the infant comes into the world.

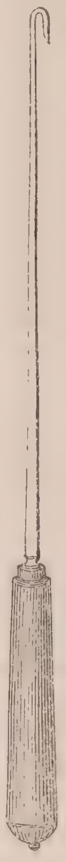
The next point of practice relates to the time at which the plug ought to be removed. This must be determined according to the circumstances of the case. Dr. Dewees advises its removal at the expiration of twelve or fourteen hours; and others extend the time to twenty-four hours. The first period is, in my opinion, too short in many cases, and the second too long in many others. When the hæmorrrhage has been profuse, and is followed by prostration of strength, there may be great danger of its recurring, on the removal of the tampon. The judgment of the practitioner alone will enable him to act according to the circumstances of the case. I am disposed to conclude, from my own experience, that the plug may be removed in most cases at the expiration of twelve hours in summer, and of twenty-four in winter. It is to be borne in mind that decomposition of blood, membranes, &c. rapidly takes place in the vagina, on account of the heat and moisture of that canal; and when this commences, the coagula and clothes will become sources of irritation. I have frequently observed that, on removing the plug at the termination of twelve or twenty-four hours, the vaginal discharge was characterized by a putrid fetid odour; there was great tenderness of the vagina, and frequently an intolerance of the plug.

In such cases, the employment of anodyne injections, composed of the solution of the chloruret of lime, the liquor plumbi acetatis, water, and opium, and sometimes of the compound solution of alumen, of our pharmacopœia alone, or properly diluted, are of great service. These ought to be employed by means of a double syringe. As a general rule, the tampon and injections should be renewed as long as hæmorrhage continues.

But in some cases the former excites the contraction of the uterus, the detachment of the ovum and its appendages, and these are expelled on its removal. This event is favourable when the preventives of abortion have failed; and there is another advantage, that the vital powers are not allowed to be reduced by slow, tedious, or profuse hæmorrhage.

Cold astringent and iced waters are sometimes injected into the vagina or the rectum, but these are rarely borne, and are now seldom employed in this country. Cold lotions and ice are sometimes applied to the hypogastric region. Nurses employ vinegar and water, over the inferior part of the abdomen, as an astringent; and it sometimes happens that the hæmorrhage ceases, when the effect is ascribed to the applications. Cold acidulous drinks are generally prescribed by obstetricians.

When the orifice of the uterus is dilated, and the uterine action is energetic, after the preceding remedies have been judiciously employed, abortion, or premature labour, as the case may be, is inevitable. In such cases it has been proposed to rupture the membranes with the finger, a probe, a stilet, a piece of wire, &c. for the purpose of allowing the amniotic fluid to escape, which will excite the uterus to expel its contents. This operation is successful in many cases; but the ergot of rye ought to be exhibited after its performance. It is maintained by many celebrated obstetricians, that rupturing the membranes is bad practice before the sixth month of uterine gestation, as threatened abortions before this period are generally prevented by the means already described, and the hæmorrhage is more alarming than dangerous. The last part of this statement is true in general, but it is liable to exceptions. Most practical obstetricians, I apprehend, have met with fatal cases of hæmorrhage caused by abortion or premature labour. It is a popular and erroneous opinion, among women of all classes, that abortion is a trifling occurrence, unworthy of notice, or of medical treatment, and rarely, if ever, fatal. The universal experience of medical practitioners attests the contrary. It rarely happens that the ovum is entirely expelled during the first three months of pregnancy; the uterus appears to be most reluctant in parting with its contents, as nature has not intended that it should, and though the embryo or fœtus may be expelled, the placenta and membranes are generally retained, and give rise to hæmorrhage, which may continue for an indefinite time, until the cause is removed. In such cases we ought to administer the ergot of rye, and, should this fail, to plug the vagina, and use injections in the manner before mentioned. The strength of the woman ought to be supported at the same time, by tonics and nutritious aliment. When the placenta and membranes are retained, the obstetrician ought to examine the os-uteri, when he removes the plug, and if he feels the placenta or membranes, to hook them down with the finger, if possible. When this cannot be effected, Levret, Leroux, Burton, Dewees, Blundell, and others, recommend the introduction of a small wire forceps, a practice justly censured in strong terms by Puzos, and now generally discarded. It would be feasible when the placenta was detached, and lodged in the neck of the womb, or tangible by the finger, but when it is recollected that this organ may be attached to any part of the uterine surface, it is obvious, that the random introduction of a forceps to seize it, without the possibility of knowing its situation, would be highly dangerous, as the operator might, much more readily, lay hold of the uterus than the placenta, and lacerate it. I entirely agree with Professor Burns, that when the pregnancy has not advanced beyond the fourth, I should say the sixth, month, it would be better to trust to smart clysters and the plug. A pair of dressing forceps, as long, but more slender, than those used in lithotomy, will often enable us to extract the placenta or membranes, when lodged in the orifice of the womb, but I should hesitate to introduce it into the cavity of the uterus, for the reason already assigned.



Dr. Dewees advises a small crotchet, which consists of a piece of steel, as thick as a small quill, fixed in a handle, and with a curved extremity. (See accompanying figure, which represents the instrument one-third the natural size.) He passes this into the uterus when the placenta or involucra are felt with the finger but cannot be extracted; and also in those cases in which a portion of the membranes remains in the cervix or os uteri, which prevents the contraction necessary to stop farther bleeding. When introduced into the uterus, he twists the extremity of the instrument so as to entangle it in the placenta or membranes. In every case in which he has used it, the discharge has instantly ceased [1].

It has been proposed to introduce the hand into the uterus, before the sixth month of pregnancy, for the purpose of extracting the placenta and membranes; but every one who has observed the size of the uterus at this period, must conclude, that the passage of the hand through its orifice, would, in almost all cases, be a most dangerous, if practicable, operation, and would most probably lacerate the organ, and excite fatal inflammation.

It is certainly within the range of possibility that the uterus may be sufficiently developed at the sixth month of pregnancy to admit the introduction of a small hand; but granting such a case, it would only be an exception to the general condition of the organ. The proceeding is, however, now the less necessary, as the ergot of rye will, in most cases, effect the desired object. Dr. Denman has expressed himself clearly upon this point: "The ovum has sometimes been retained in the uterus for many months after the symptoms of abortion had appeared, and when it had lost the principle of increasing. But it is not now thought necessary or proper in abortions to use any means for bringing away the ovum, or any portion of it, *with instruments or manual assistance*."

When abortion cannot be prevented at the sixth or between that period and the seventh month, it is to be treated as natural parturition. In such cases there is rupture of the membranes, discharge of the amniotic fluid, expulsion of the fœtus and of the placenta, which occur in regular succession. The placenta and membranes are rarely retained after the birth of the fœtus; but should it be so, the administration of the ergot of rye will seldom fail to excite uterine action sufficient to cause their expulsion. It is an error to suppose that this medicine cannot act on the uterus before parturition has commenced; I am certain that it acts on the uterus at any period after conception, and even on the unimpregnated condition of the organ. I have found it in numerous cases an efficient emmenagogue; and consider it irreconcileable to science to suppose that any medicine can only act on an organ when it is performing a part of its function, but not at any other time.

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[1] American Cyclopædia of Practical Medicine and Surgery.

The treatment of women after abortion must vary according to the symptoms of the case. When there is prostration of the vital powers, or great debility, the use of stimulants, tonics, and invigorating aliment, will be necessary. The health is often shattered and ruined by repeated abortions, and must be restored when possible by appropriate means. Warm rooms, tight lacing, late hours, and all debilitating causes are to be avoided. When the abortion occurs between the fourth and sixth month, or when premature labour comes on from the seventh to the ninth month, the same treatment ought to be employed as after natural parturition.

When abortion is habitual, it is difficult to prevent it by any means that may be employed. The following plan will in general succeed, if regularly pursued:—

I°. As soon as conception has occurred, the patient ought to be confined to a sofa, or to bed, in which she should remain until the usual period at which she aborted before, is passed.

II°. Leeches ought to be applied to the hypogastric region, groins, or external labia, a few days before the recurrence of each menstrual period; or small bleedings may be had recourse to instead. The venesection, or sanguisuction, and opiates should be repeated before each menstrual period, until the pregnancy has advanced a month or two beyond the former period of abortion.

III°. Aperients are necessary to regulate the bowels, but all drastic medicines ought to be avoided. The combination described below [1], followed by seidlitz, soda, or lemonade powders, castor oil, or magnesia, with a small quantity of lemon juice, are highly useful. It acts efficiently without causing any tormina, or exciting the uterus.

IV°. The diet ought to consist of vegetable jellies, such as arrow-root, sago, tapioca, Iceland or Irish moss, &c.

V°. Conjugal intercourse ought to be strictly prohibited.

I have employed this plan of treatment from the third to the eighth month, in the case of a lady of rank, who had had seven abortions between the third and fifth months of former pregnancies. She arrived at the full term, and brought forth an heir, who secured the estates and title which would have otherwise passed into the possession of a different branch of the family. Dr. Dewees, Dr. Jackson, and others have applied blisters to the sacrum and abdomen in such cases, with a view of exciting counter-irritation, and preventing uterine action; but the former has not employed them for some years past. Tonics, chalybeates, mineral waters, change of air, sea-bathing, or cold bathing, are highly beneficial, during or after the convalescence of abortion in delicate, nervous, and irritable habits, predisposed to the disease. Stimulating liniments alone, or mixed with tonics, may be rubbed on the loins and hypogastric region, and are much praised by recent authors. These means ought to be employed between the conceptions, and a conjugal separation ought to be observed after abortion, as pregnancy very speedily occurs to women liable to this disease.

The debility caused by abortion is accompanied by great pallidity, or a tendency to anæmia for which the preparations of iron are highly advantageous. I have given the carbonate of iron with aromatic powder in many cases with the best effects. The other preparations of this medicine are also valuable. Tonics, quinine, the chalybeate mineral waters, nutritious aliment, pure air, and other restorative means are highly necessary.

(*M. Ryan.*)

ABRASION, from *abrado*, to shave off. The mechanical removal of the epidermis, whether from the violent friction of machinery, or from slow but continued rubbing, by which the cellular tissue is exposed; in vulgar language, the denuded parts are said to be "*raw*." Occurring on the mucous surfaces, abrasion is a superficial excoriation, from which membraniform shreds are detached. The mucous membrane of the urethra is said to be abraded when violence is done to it by awkwardness in sounding, or by the immethodical application of caustic.

ABSCESS. *Abscessus*, derived from the verb *abscedere*, to depart, or separate from. The word is known in medical language, since the time of Celsus, and is applied to every species of accumulation of pus, that obtains, in the various structures of the body. Pathologists are not agreed, whether the term has arisen in virtue of the anormal separation, which the accumulating pus produces, of the organic layers, or laminæ, in which it is deposited, or of the vital phenomena, by which, the new fluid is separated from the blood. The word is not employed to denote purulent collections within the natural cavities of the pleuræ and peritoneum; such collection, being designated by the term "Effusion," will be considered hereafter. Strictly speaking, therefore, an abscess may be defined, a collection of pus, in an accidental, or preternatural cavity. An abscess is never a primitive affection, but is itself, always the consequence, or the termination of some inflammation, either manifest or obscure, which has preceded it, in some of the living tissues. Pus, like the substance of false membranes, bands of adhesion, and other pathological productions, has its origin in all cases, in inflammation, in some shape or degree. The opinion maintained by Dehaen, and his followers, that pus was perfectly formed in the blood, and circulating with it, could be deposited in our organs, without previous inflammation, is now no longer adhered to, by any physiologist. Modern researches have led to a more correct view, and explanation of the circumstances, which our predecessors alleged in favour, of abscess by metastasis; for let it be granted to the fullest extent, that an abscess, fully formed, may suddenly disappear, and that another may as suddenly be formed in a different part of the body, we still have other means more in accordance with the laws of physiology, to account clearly for the phenomena. It is not necessary to suppose a veritable migration of the pus for such a purpose, when the displacement of the irritation affords a more rational explanation of them. Inflammation being the only cause of abscess, the pus is absorbed, and disappears under the agency, of the eliminating powers, and new pus is formed, where the new inflammation has manifested itself. There is, however, a class of purulent formations which have been brought under closer observation of late years, and which have been treated under the head of "Metastatic abscesses," to which we shall advert in another place. (See Purulent Depôts.) The origin of all abscesses, in inflammation of some kind or degree, may therefore be taken, as a general or common character; in almost every other respect their differences are infinite. Thus they differ in the shades of inflammation, which precede their formation, in the parts in which they are formed, in their progress, in their extent, number, and position with respect to the internal or external surfaces of the body, and to the qualities of the fluids they contain.

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[1] ℞ Extracti colocynth. comp. ℈ij; extracti hyoscyami ℈j; hydrargyri submur. ℈ss; olei menthæ piper, ♏. V.

In pilulas xij. vel xv. divide, quarum sumatur una mane nocteque si opus sit.

Pathological writers have availed themselves of some of these leading differences, to establish divisions, for the methodical consideration of the entire subject. Thus, from the conditions in which the inflammation has arisen, from its degrees of intensity or moderateness, from the greater or lesser rapidity of its march, has been established, the well known division into *acute* or *hot inflammatory abscess*, and *cold* or *chronic abscess*. The more modern, and more severe pathologists reject this division, as improper, and inapplicable to tumours, differing in their nature, and depending on different vital lesions. They regard all purulent tumours, as having the same origin; namely, inflammation, and think, that the chief object of the practical surgeon should be, to study the modifications they present, according to the intensity of the inflammation that produces them, the nature of the organs in which they are developed, or according as the accumulation of the pus takes place in the tissue in which it was first formed, or as it may, by making way through the cellular membrane, present itself in a depending and distant situation.

Having admitted inflammation to be the invariable origin of abscess, the different phenomena which succeed each other, from the invasion of the inflammation, to the perfect formation of the pus, should now be passed in review. The afflux of blood in the inflamed parts increases in the ratio of the violence of the irritation, of which they are the seat. The distension proceeds gradually, till some of the vessels give way, and the blood is shed around into the substance of the organs, which thus becoming more compact and heavy, lose their elasticity. When this state of engorgement is allowed to go on unchecked, the parts lose their natural power of resistance, and are broken down easily; they become disorganized, and together with the blood, with which they are loaded, are softened into a pulpy mass, which gradually dissolves into a sanio-purulent fluid. This fluid, however, is not formed solely from the blood, which in the progress of the inflammation had distended and ruptured its vessels; it consists also of the debris, or destroyed portions of the solid tissues, with which it combined. These elements are still distinctly discernible in the fluid, which flows from abscesses, that are opened, before they are allowed to maturate, as in furunculus, and even in some abscesses that have come to full maturity; as for instance, in suppuration of the liver, the matter is almost invariably of a reddish brown colour, and often contains portions of the disorganized viscus, which give it a grumulous appearance, like the lees of wine, or coffee grounds. The pus, however, in the early stage of the suppuration, is not collected into one general cavity; before this occurs, many small focuses, previously formed, and perfectly distinct, must be broken up, by the gradual disruption of the cellular, or organic walls, within which they were primitively confined; many of these separations, however, even in very large abscesses, after undergoing attenuation to a considerable extent, remain as bands and threads, which exist unbroken, in the abnormal cavity. They are broken down successively, as the suppurative action is extended, and disappear entirely, when the cavity becomes very large; but as long as they exist, they tend to check the extension of the suppurative action, and when it is terminated, they help to draw the sides of the cavity together, and to form the foundation, for healthy adhesions of its walls. Blood-vessels of a certain size, and nerves, when they happen to be placed, in the midst of the focus, resist this breaking down, and preserve their normal communications in the bosom of the abscess, between the parts which the pus has separated; while the walls of the cavity are being thus extended, by successive additions of small isolated neighbouring focuses of pus, the pus itself becomes more and more perfectly elaborated; the last traces of the colouring matter of the blood disappear, the broken down organic debris fall to its sides and adhere to them, the pus becomes more homogeneous, and finally forms a fluid, *sui generis*, endowed with properties differing from those, of all other animal fluids.

But it must not be inferred from this description, that the accidental isolating membrane of an abscess, is nothing more, than condensed cellular tissue. Sometimes, the isolating sac is formed without cellular tissue, as in abscesses of the brain; in most cases, however, it is formed by the surrounding condensed cellular tissue, together with, organized matter, which is effused during the suppurative process.

The pus of an acute abscess, is in general cream-coloured, or whitish, homogeneous, soft to the touch; it is heavier than water, in which it is partly dissolved; it is free from unpleasant smell, and as long as, the air is excluded, it exerts no irritative action, beyond that of its bulk on the tissues in which it is confined: in colour, it bears a strong analogy, to the mucus, secreted from mucous membranes, under the influence of irritation; but the colour excepted, it differs from it, in almost every other respect. It is said, that mucus will float in water, while pus sinks to the bottom of the vase: this statement stands in need of explanation. The mucus of calculous patients, or of persons labouring under chronic inflammation of the bladder, does not float in the urine, but is deposited, and adheres, with great tenacity, to the bottom of the vase; if detached with an instrument, and beaten up in the water, it will not dissolve in it, but floats as long as the water is kept agitated, in the shape of soft fleecy lamellæ, which subside without adhering again into a viscid mass, as soon as the water is allowed to rest; pus, on the other hand has none of this elastic toughness, it mixes, or is dissolved, in a certain proportion in water, giving it a whey-like, or lactescent appearance; the rest, falls to the bottom: if the supernatant fluid be poured off, without disturbing it, the pus will be easily recognized by its greyish white colour, and inelastic oily flow, when the vase is lifted upon its side. Pure mucus is always characterized by this viscid tenacity. When the mucus voided in the stools, in vomiting, in expectoration, or in the urine, assumes a greater degree of opacity, and becomes puriform, it is often of great importance to determine whether the fluid voided, be not the matter of an abscess, developed in the tissue itself, of those organs, or of the neighbouring parts; the method above mentioned of examining the fluids voided, will be often found satisfactory, in lieu of other tests. (See Pus.)

Whatever be the character of abscesses, or however rapidly or slowly, they may be formed, some pathologists have considered that their march might be divided, into three periods; in the first, the pus is secreted in the cells of the inflamed structure; these cells successively break into each other, and form a common centre. In the formation of this cavity, however, there is no real loss of substance, the walls are simply forced apart, and condensed. In the second period, the abscess is matured, and if not masked by thick and resisting parts, it tends towards the surface of the body, under which, it presents itself, in the form of a tumour. The movements of a fluid can now be discovered in the tumour, by palping with the fingers alternately, two points of its surface; and this undulation, in various degrees, is the peculiar characteristic of the fully formed abscess, the facility and certainty of the diagnostic, being directly relative, to the fulness of this fluctuation. The third period includes the termination, which may be effected by *resolution*, in which the pus is absorbed, the cavity which contained it disappearing; or by evacuation through spontaneous or artificial openings. When the *termination* by either of these modes of opening, proceeds favourably, the pus is at once, or gradually discharged; the cavity which contained it becomes by degrees narrower, till its sides join again, and little or no trace, save a slight degree of induration and redness, and perhaps a little more than the usual sensibility of the parts, remains to mark the situation, in which it had been developed. Of the less favourable termination of abscesses, we shall speak hereafter.

We have passed in review the different anatomical states of an abscess, from its commencement, to the period when an accidental membrane, circumscribes the purulent collection.

Let us now examine the nature of the boundary, which isolates the pus, from the surrounding tissues, and the functions which it performs. The conditions of this wall, or cyst will be found to vary, according to the degree of rapidity, or slowness with which the abscess has been formed, the parts which it occupies, the intensity of the phlogosis in the surrounding tissues, &c. In the acute abscess of rapid formation, the development of the cavity is too sudden, to allow the cyst to be much altered, from the condition of the cellular tissue, which surrounds the centre of irritation; but when it takes place slowly, and in parts, abounding in the cellular element, as for instance, in lymphatic ganglions, or in the interstices of deep seated muscles, its walls attain a considerable degree of density and strength. The cellular tissue being the chief constituent of this boundary, whenever an abscess is formed in organs, where this element is scanty, the cyst will be in the same degree attenuated; thus, in the soft parenchyma of the brain, it will have the appearance of a delicate vascular membrane, which can be scarcely distinguished from the substance of the brain itself.

The functions of this boundary or cyst, are by no means limited, to confining the pus, within the living organs, but form in themselves an interesting feature, in the history of purulent collections. The external surface of this accidental sac is continuous with the surrounding parts, and on this connexion, its life depends; its internal surface which is in contact with the pus, on account of the exhalation and absorption which take place upon it, furnishes points of analogy with the natural secreting membranes. This surface is of a reddish grey colour, and tomentous or filamentous texture. The pus within this cavity therefore is not in the condition of a foreign body, but is continually acted upon by the internal surface of the sac modifying its quality, increasing or diminishing its quantity, according to the activity of the functions proper to it. Nor can the pus itself be regarded as destitute of vitality, for it maintains its properties without alteration by chemical agency; and when the functions of its living covering are so directed by the powers of the œconomy, is capable of being again taken up by the absorbents, and after undergoing the changes of absorbed fluids, of being eliminated from the body, or again poured as living blood into the torrent of the circulation. Under various degrees of stimulation, this fluid may become more or less consistent, and even impregnated with substances taken into the body. Upon this fact of the vitality of the envelope of an abscess rests all the hopes of the pathologist, to obtain, by appropriate treatment, or by the efforts of nature, the spontaneous resorption of the pus, and the consequent rescuing of the patient from the inconveniences, and even the dangers too often resulting from its external evacuation.

The phenomena which we have been hitherto contemplating belong, in the majority of instances, to inflammation of an acute character, arising suddenly and with a greater or less degree of violence. But there is still a numerous class of abscesses in which the preceding irritation is either very moderate or so feeble as to be scarcely perceptible, and in which, nevertheless, the collection of pus, though slowly effected, may be very considerable. These abscesses are almost exclusively confined to the cellular tissue, and are chiefly subcutaneous. They are observed to occur mostly in weakly subjects, persons of a scrofulous constitution, or who have been much subject to rheumatism; their seats of predilection are the covering of the chest, the neck, the pelvis, the loins, and the upper part of the thigh; and when in this last named situation, may be easily confounded with another species of purulent collection, *the abscess by congestion.* As it has been already observed, they are often preceded by so little pain or heat, that they attract no notice till the fluctuation is fully discernible. But their formation is often preceded by chronic engorgement or induration, which is dissipated as soon, or soon after the fluid is recognizable; in such cases the progress into the suppurative stage is exceedingly slow, and will mostly require to be hastened. The process itself differs considerably, not only in degree but in effect, from what takes place in the *hot* inflammatory abscess. On account of the slight irritation and increase of blood in the parts affected, the abscess, instead of being made up of a large number of small collections, first presents itself as one focus to be gradually enlarged. The fluctuation, too, even in its earliest stage is more manifest, for as the pus of the inflammatory and rapidly formed abscess is more consistent, so the pus in the cold or slowly formed abscess exhibits the reverse of this quality; it is thin, serous, greenish, not unlike whey in which small portions of the curd may be still discovered. When the irritation has been too obscure to be remarked, and the fluid is very thin, pale, and transparent, it would seem more like the effect of some unknown perversion of the nutrient function in the parts, whereby the natural exhalation in the areoles of the cellular membrane is altered, than the product of any inflammation, however slight in degree. These are the common characters of pus in these abscesses; but there are also in this respect many varieties. It is sometimes charged with shreds of cellular membrane, sometimes as consistent and transparent as the vitreous humour of the eye, and sometimes also more consistent still, like honey, or softened lard, thus forming as it were a link between the contents of abscesses and those of tumours of a melicerous or steatomatous nature. The slowness with which the chronic abscess is developed produces a corresponding influence on the formation of its walls: the wall itself is thicker, more perfectly organized, and from this greater condensation, in some instances, it comes nearer to the character of cysts or encysted productions, and there is little or no trace of inflammation to be discovered in the parts surrounding the cyst: the internal surface is greyish red, soft, villous, and, excepting some irregular productions, is so distinctly membranous as to resemble mucous surfaces. When the abscess is fully formed, it presents itself immediately, or almost immediately, under the skin as a soft, indolent, circumscribed, undulating tumour; the skin is readily moved upon it, and retains its natural colour and sensibility, except when the distension becomes very great, and the abscess is on the point of bursting.

In the two preceding varieties of abscess, we have seen that the matter is formed in the parts which had been previously irritated; there is however another variety of this affection, which differs from them in this respect, as well as in the cause that gives rise to them, and which on this account, may be designated as the symptomatic abscess. It depends not upon an irritation in the parts surrounding the collected pus, but on the affection of some other organ, neighbouring or remote, and of which it is an evidence, or a symptom. If the part primitively affected be surrounded by very loose and permeable cellular tissue, and the pus be formed by slow, and insensible degrees, it easily makes way through the loose membrane, without irritating it in a perceptible manner, and, according to the resistance it may encounter, gravitates, either in a direct or tortuous course, as it is impelled, by the action of the muscles, or the pressure of the surrounding parts, into more declive situations, at variable distance from the place where it was first poured out; thus forming the tumour, known as the *purulent depôt* or *abscess by congestion.* True it is that many abscesses may be symptomatic of a local affection, which differ much from that here characterized as such. But in the present instance, we mean the species which depends most commonly on caries, or any other organic alteration of a bone, on the softening of the vertebræ, the erosion of their fibro-cartilages, &c. The pus formed in osseous tissue meets its greatest resistance at the very outset of its progress, in the periosteum and fibrous capsules: from the action of the pus on these structures, or perhaps, more correctly, in consequence of the inflammation extending to them, they fungate, and thus becoming softened and weakened; the pus perforates them, and fuses into the surrounding cellular tissue, and takes its course along the interstices of muscles, or the line of vessels and nerves from above downwards, making its way towards the surface of the body.

The term "congestion" however requires further qualification. Pus congested, that is to say, accumulated in a situation more or less remote from its principal source, is not necessarily the product of diseased bone, ligament, or cartilage; such accumulations of pus may take place without any of these structures being at all affected. When matter is formed behind the peritoneum after simple psoitis, either in the cellular membrane connecting the psoas muscle with the vertebræ, or in the body of the muscle itself, instead of making way to the surface in its immediate neighbourhood, which it could not so easily do on account of the compactness and resistance of the parts it would have to pass through, it descends in the same course of gravitation, favoured by the laxity of the cellular tissue, which opens a passage for it, by the vertical attitude of the body, and by the movements of the muscles and abdominal viscera, until it can manifest itself externally as a fluctuating tumour. Abscesses by congestion therefore, though so frequently connected with and dependent upon alterations of the osseous structure, as to form in a manner the type of this species of abscess, are not necessarily so, for the pus of any other abscess would be congested in like manner, if the same causes existed to produce the displacement of the fluid, the matter in any case being collected in a declive and distant situation only because a certain condition of parts precludes its being collected near its source, while that of other parts favours its descent and accumulation farther off.

But to whatever disease these abscesses owe their origin, they form tracks, according to the case, running from the vertebræ of the back or loins, and even from the transverse processes of these bodies, from the posterior extremities of the ribs, from the internal surface of the bones of the pelvis and sacrum behind the peritoneum, along the pillars of the diaphragm, in the course of the psoas muscle, along the inguinal canal, under the crural arch; or in the pelvis, along the junction of the sacrum and ilium, following the obturator, or the gluteal vessels according to the resistance the pus encounters and even sometimes along the course of the ischiatic nerve, till it forms a fluctuating tumour externally, appearing most frequently in the groin, and sometimes in the upper part, and upper and inner part, or at the upper and back part of the thigh, at the under edge of the gluteal muscle, in the perineum, at the verge of the anus and vagina. These are by far the most frequent situations in which this species of abscess occurs; but they are also observed close to the knee, on the internal, external, or posterior part of the thigh, symptomatic of the disease, so improperly termed, spontaneous luxation of the head of the femur; and on the lower part of the circumference of the arm, when the shoulder is the seat of the primitive affection.

The anatomical conditions of the symptomatic abscess deserve particular attention. At its source, the bones are more or less profoundly attacked, presenting the different varieties of discolouration of substance, friability, softening, disappearance of the lamellar structure, and destruction of substance, which characterize the morbid alterations of bone: the periosteum, or other annexations are in a softened and fungous state; the walls of the passage by which the pus drains down, as well as those of the reservoir which receives it, are engorged, thickened, and sometimes as firm as cartilage. This canal, which is commonly more or less tortuous, ends in an extensive cavity filled with pus, which manifests itself as an indolent and fluctuating tumour, in one or other of the situations above mentioned, with or without an external opening. The lining membrane of the cavity is vascular, thin, of a greyish dark colour, and capable of great activity, more especially when atmospheric air has been allowed to penetrate into the cavity of the abscess. The skin covering the tumour retains its natural colour and mobility, and is free, at least at first, from any engorgement that may have preceded or prepared the way for the arrival of the pus at the surface.

The pus itself in these collections presents various degrees of elaboration. When first discharged, it is thin, mixed up with albuminous shreds, clots of blood, and fragments of phosphate of lime, and is of a greyish yellow, or sanious colour. At this time it has a faint disagreeable odour, but after the abscess has been opened a few days, and the air has penetrated into it, it becomes highly fetid, exhaling a smell peculiar to the suppurative destruction of bone.

Authors have dwelt much in particular description of lumbar abscess, setting it apart, as it were, from abscess of every other kind. The differences which it presents from other varieties are merely such as depend on their cause, progress, and situation; the general character is however the same. It is sufficient to sketch its prominent features in this article, and as the purulent collection in these instances is itself nothing more than the symptom of another disease, for its particular characters and pathological anatomy, we shall refer to the articles, CARIES, DISEASES OF THE VERTEBRÆ, &c.

Having now considered the general characters of abscess, we shall notice a variety of this affection, in which the membrane circumscribing the pus is wanting, the inflammation is diffused, and the accompanying general symptoms are of a formidable character. This form of abscess is described by Duncan under the name of diffused phlegmon, and is more commonly known, under that of Phlegmonous Erysipelas. It is observed to occur in persons of bad habit of body, who have undergone severe labour and hardship; it occurs also after inoculation by dissecting wounds. It seems not to depend so much on the *seat*, or *intensity* of the inflammation, as on its peculiar *nature*, and the absence of any disposition in the economy to furnish the plastic principle, without which the circumscribing membrane of abscesses cannot be formed. In this variety, we do not find a single cavity, but a considerable number of small spaces, having externally for boundary the skin thinned, detached, and sloughy; it also burrows deep between the muscles, separating them as it were with a scalpel. At first there is very little pus distinguishable in a much greater quantity of bloody serum, with which the cellular tissue seems impregnated. When these collections are opened, and the inflammation becomes circumscribed, the matter is isolated as in the ordinary phlegmonous abscess, by the production of the proper membrane of such collections.

Many varieties of abscess might be added to the foregoing if we were, in imitation of other writers, to establish them on the nature of causes, or on the dependence they may have on certain morbid states of the body. But such a mode of dividing the subject would be no longer in accordance with the spirit of exactness that characterizes the present state of pathology. Abscesses under the titles constitutional, scrofulous, rheumatismal, syphilitic, &c. cannot therefore find a place in this article. Abscesses produced by the irritation of foreign bodies, liquid or solid, whether introduced from without, or produced in the body, such as urine, fæces, bile, blood, milk, saliva, &c. are also excluded. In this place a simple indication of them will suffice as they form the subject of special consideration under their respective heads, to which the reader is referred.

*Progress and termination of Abscess.*—Inflammation occurring in the living tissues may at any period of its progress be arrested and extinguished, even though it shall have proceeded to the full formation of pus. But the probability of such an event is greater before the inflammation has proceeded to its height, or been followed by those changes in the condition of the parts which precede or accompany the formation of pus. This extinction of the inflammation and resorption of the newly deposited fluid, takes place under various influences, but whenever the case is so, the resorption is preceded by the disappearance of all the local symptoms of congestion and phlogose. The circulation at the circumference of the tumour becomes less frequent; its redness, swelling, and heat are lessened; there is exudation of thin serum from the vessels of the part, or on the secreting surfaces; the tumour softens and subsides, and the sense of fluctuation can no longer be discovered, and the patient is relieved from all the inconvenience and danger of protracted suppuration. The process by which this most favourable termination is effected, is known by the name of *Resolution.*

In very rare instances, where the inflammation, having been slight, has disappeared, and the pus is not absorbed, the walls circumscribing it become thickened, and the abscess remains stationary like any other foreign body that has been isolated from the living parts by a cyst. But we must not often expect to see the purulent absorption and exhalation in the abscess so nicely balanced; one of them predominates, most commonly the exhalation, and hence the progressive enlargement of the cavity. But when the inflammation is very severe, and the texture of the parts has suffered in a greater degree, pus is formed in quantity, the absorbents show no disposition to remove it, and the mass of fluid continues to increase more or less rapidly in proportion to the degree of irritation kept up by its own presence, by the further extension of the inflammation into the surrounding parts, or by a purulent exhalation from the walls of the puogenic cyst. Rebellious to the power of absorption, the pus now falls under that of another general law of the economy, in virtue of which it endeavours to expel all foreign substances capable of irritating the organs of the body. The pus, by its accumulation, compresses, displaces, and fatigues the surrounding parts, and tends towards the outer or inner surfaces of the body, mostly the former, seeking an opening for its final escape. The increase in quantity of the pus has an important share in effecting the transfer of the whole mass of fluid from the place of its original formation to the surface of the body: although pressing with equal force on all sides of the cavity that circumscribes it, it does not meet every where with the same resistance; its progress towards the internal surfaces is opposed by the mutual support which the internal organs afford each other; in a word, by the absence of cavity: not so the external surface; the only opposing power at the periphery of the body is the weight of atmospheric air and the texture of the integuments, towards which continuous tracks of cellular tissue may almost every where be found.

The progress of the pus towards the surface is not, however, a simple result of compression and distension in that direction; they excite or combine with an organic movement, which requires to be noticed. The compression and distension become strongest in the direction in which the resistance is weakest, exciting inflammation and ulcerative absorption, and this process continues to remove every barrier till it attacks the skin itself, which is often perforated at several points over the abscess. A remarkable effect of this precessional process is the adhesion which it establishes between the walls of the abscess and the parts upon which the purulent cavity advances. The skin, covering a deep seated abscess, at first shows no sympathy with it; as soon however as the pus begins to advance, all the elements in succession sympathize with it, till the skin, in its turn, changes colour, becomes blue or dusky red, adheres to the wall of the abscess, and ulcerates with it. Hereafter we shall see that this march of irritation is of great value in helping us to detect deep seated abscess, as well as in pointing out the existence of that degree of internal adhesion, without which the opening of many purulent collections would be attended with danger of fatal effusion into other organs.

The most formidable obstacle to the transfer of deep seated pus to the surface, is encountered in the fibrous tissues and inextensible aponeuroses which occur in its direct course. The vitality of these structures being too low to sustain the ulcerative process, the pus, when thus obstructed, burrows, and, as it were, dissects its way along the cellular tracks, sometimes against its own weight, until by finding an opening it is enabled to resume its direct course outwards; and thus are explained the flexuosities which are sometimes found in the course of an abscess. The progress of the matter, when opposed by a great extent of aponeurotic surface, is sometimes favoured by the openings it may offer for the transmission of vessels or nerves: it works its way through these openings, thus shortening its course towards the skin. In such cases, the matter is divided into a superficial and deep-seated collection, connected by the narrow opening in the fascia or aponeurosis. Instances of this bilocular condition of the abscess occur in inflammations of the sheaths of tendons, in abscesses external to the pleura, passing through the intercostal spaces, and spreading under the skin. While the anterior or moving wall of the abscess is thus thinned and advanced, the posterior one remains stationary, or becomes thickened in a considerable degree.

The compression and distension, however, may take the opposite direction, and tend towards the internal surfaces of the body. In this respect, the result depends on the resistance opposed by the surrounding parts to the extension of the purulent sac. There are numerous instances of abscess, formed not very distant from the external surface, which have, notwithstanding, been evacuated through some internal organ. Abscess, under the strong aponeurosis of the parotid, often bursts into the mouth; abscess of the liver into the colon, the duodenum, and stomach; abscess of the right iliac fossa into the cæcum, or even into the bladder; abscess of the kidney into the colon, &c. It is related of the son of Petit that he died of an abscess between the ribs, which burst into the cavity of the pleura. Similar cases are on record as affecting the peritoneum. The fact related of the son of Petit will appear the more curious when contrasted with others in which abscess of the substance of the lung has been known to produce adhesion of the two folds of the pleura, and destruction or wasting of the intercostal muscles, the abscess pointing under the skin. A remarkable case of this nature presented itself lately to Mr. King, in which the pulmonary abscess burst through the nipple, evacuating a large quantity of matter.

The general progress of purulent collections is, however, from within outwards, even when developed in contact with serous membranes, for, as it has been already observed, the surface of serous membranes is fortified by the organs which they envelope. Indeed the bursting of abscess into serous cavities is very rare; and this is easily explained, because, as soon as the irritation reaches the visceral portion of the serous membrane, it secretes plastic matter which pastes it to serous membrane lining the walls of the cavity, or to the serous envelope of some neighbouring hollow viscus: this plastic lymph is rapidly organised, and if the abscess continue to point internally, the inflammation, by agglutinating all the parts, obliterates that point of the cavity into which the pus would else penetrate; the parts thus fused together are in their turn attacked by the ulcerative process: the mode by which the transfer of the matter is effected is still however the same, nature establishing continuity of tissues where contiguity only had existed. We may repeat, however, that the tendency inwards is rare, and probably never occurs unless when favoured by some morbid condition of the sac, backed by the resistance in the opposite direction of strong fasciæ and aponeurosis. It would, however, be an error to attribute the enlargement and extension outwards of the purulent sac to the mechanical force of compression and distension alone. Pus, shut up in bony cavities, dilates and thins their walls before it softens and perforates them; instances of this expansion are seen in the antrum, the frontal sinuses, and even in the cranium itself; and it is doubtless the effect of some modification of their nutrition.

When the pus arrives under the skin, the integument adhering to the wall of the abscess is gradually thinned to the tenuity of an epidermic pellicle, and the continuance of the precessional process of ulcerative absorption is manifested in the appearance of one or more phlyctenes, through which the matter soon oozes or bursts out.

If the cavity of the abscess be small, and the spontaneous opening sufficient, it may be entirely evacuated at the moment, and the sides of the cavity may become agglutinated in twenty-four hours; an effusion of organizable lymph replacing instantaneously the puogenic action. But this does not often occur. In general after an abscess is opened, a new series of phenomena arises; and these, it is stated, are much modified by the admission or non-admission of air into the interior of the abscess.

It is remarked when an abscess opens spontaneously, that all the pus is seldom evacuated at once; it comes away gradually, and in quantities barely sufficient to relieve the walls of the cavity from tension. This is the case in almost all considerable collections. The wall of the abscess thus accommodating itself to the volume of the fluid, the air is kept excluded, there being no vacuum formed to compel its entrance. The maintenance of this condition in evacuating large abscesses is considered so favourable, that surgery aims at imitating it by the plan of the oft-repeated small punctures, instead of large incisions.

When air penetrates into the cavity of an abscess, symptoms of increased irritation are speedily observed to follow. The parts covering the abscess become hot; the redness, pain, and tension return in an augmented degree, and there is fever of variable intensity. This effect of the admission of atmospheric air has been the subject of controversy. It is generally supposed that the air determines putrid decomposition, the elements for which, viz., air, warmth, moisture, and decomposable matter, are all present, and that the inflammation which attacks the puogenic membrane is the consequence of this decomposition. The inflammation of an extensive membrane re-acts on the principal organs of the body, which manifest their sympathy by disturbance of function; thus explaining the fever, vomiting, diarrhœa, &c. The renewal of the inflammation and the decomposition of the chemical elements impart to the matter issuing from the focus a degree of fetidity that is almost intolerable. These changes are remarkably rapid, for the pus, which at the first opening was of good quality, assumes a bad character; it becomes thin, sanious, and excessively acrid.

M. J. Cloquet dissents from this opinion as to the effect of the introduction of air into the abscess, in producing an alteration in the qualities of the pus; he thinks, that the putrid fermentation takes place from the want of pressure on the fluid, and that gas is evolved from it, whether the atmospheric air be excluded or not. But there is no necessity of adopting either of these opinions literally. It is by no means probable that the pus of the abscess is thus altered, in consequence of the chemical decomposition of its elements; it is much more rational to suppose that the pus is secreted of a bad kind, from an unhealthy modification of the organ secreting it. No one entertains any doubt that high constitutional irritation follows the opening of these collections, and many persons will be disposed to admit that the inflammation or irritation of internal organs may have a good deal of influence in deteriorating the qualities of the pus, the more especially as air has been known to penetrate into abscesses, without being attended with these consequences, and it is also matter of observation, that the condition of the pus, whether of an abscess, or an open wound, alters and becomes worse, when the internal organs are irritated and their functions disturbed. But whatever be the value of this reasoning, the exclusion of the air from the cavity of a large abscess is looked upon as a point of some importance, and when secured, is a chance more in favour of the patient. But this advantage cannot be insured with the same facility in all cases, and in some it is wholly unattainable.

When the membrane of an abscess is surrounded by soft and moveable parts, it may subside so accurately and regularly upon its contents, as to be adjusted to the quantity evacuated. But when it is fixed to bones, or immovable parts, this facility of accommodating itself to the bulk of the fluid is wanting, and the air rushes in whenever the sac and its contents become disproportioned, as inevitably as air rushes into a bottle, from which a fluid is poured out. The mobility of the walls of an abscess has a marked effect in diminishing the danger arising from the quantity of the suppuration, by facilitating the gradual but rapid adhesion of its sides; in other words, the danger of exhaustion is often relative to the extent of the suppurating cavity, and the fixity of its walls, independently of the nature of its cause.

The puogenic membrane undergoes remarkable changes consequent upon the discharge of the contents of the abscess: the greyish flocculent surface becomes more vascular, and granulates in the same manner as the surface of a wound; the sides bud out firmly, all tending towards the centre; the extent of the cavity diminishes rapidly, the sides at last unite, and the cavity disappears. The tissue of new formation is at first plastic or lymphlike; it becomes more and more firmly organized, and is at last undistinguishable from the cellular structure surrounding it.

But it also happens when an abscess is once opened that the purulent matter continues to be furnished for an indefinite period: the pus, however, is the only feature of the disease that remains the same, for the space which the collection occupied contracts, and the walls become thickened, fibrous, and even cartilaginous.

*Diagnostic of Abscess.*—When suppurative inflammation attacks a part, it may run very rapidly through its different periods, more especially if it occur in parts, abounding in the cellular element. The facility of the diagnostic, as to physical signs, will be relative to several circumstances, such as the superficiality, or depth of the collection, the mode in which the pus is diffused, its quantity, its liability, on account of situation, to be confounded with aneurismal or other tumours, the nature or fluidity of the pus itself, the degree of distension which it makes upon its cyst, its being masked by a strong, thick, and unyielding, aponeurosis, &c.

The existence of an abscess is readily recognized when the fluid forms a tumour near or under the surface, presenting a soft, salient, deep, red, blueish, or whitened point in the centre, or when the covering of the tumour is thin, and the matter of the collection is fluent; under these circumstances, the local characteristic sign, fluctuation, will be most manifest. In order to determine the undulation of the fluid, we should proceed in the following manner: the side of the tumour should be covered with the palm of the left hand, or the ends of the fingers united; slight shocks should then be communicated to the opposite side, with the fingers of the right hand. Under the impulsion the fluid of the abscess is agitated, and the left hand reposing upon the tumour, perceives clearly the movement of the fluid displaced by the impetus. The left hand should be kept in perfect repose, for if the fingers, covering different parts of the tumour, are made to press on it alternately, the sensation will be much less defined; and in a case of obscure or deep seated abscess, such a mode of investigating would be of no value, as the sensation would not differ sensibly from the vibration obtained from parts in a state of simple engorgement. But though recognizing fluctuation as one of the principal physical signs of abscess, it is right we should be on our guard against some of the illusions of touch. The inflammatory swelling of the cellular tissue, when it is loose, free, and highly extensible, communicates an elastic feel, which simulates fluctuation; this is particularly the case on the back of the hand, and in the vicinity of the articulations: the infiltration of serum may simulate the undulation of pus in the same manner. The dartos, when the testicle is inflamed, is thus infiltrated without there being a hydrocele; and rheumatism, produces effusion in the neighbourhood of joints, which may also impose upon the practitioner.

The physical signs, however, form but a part of the groundwork of the diagnostic of abscess. In addition to these, there are others no less remarkable and important, some of a local and some of a constitutional nature. The change from inflammatory engorgement to the maturation of pus has its peculiar signs, which are developed with the progress of the malady in the part itself: the intensity of the inflammation somewhat abates, the heat, redness, and symptomatic fever diminish; the character of the pain is altered from a quick, burning, pungent throbbing, to one in which a sense of fulness and weight predominates; the tumour becomes larger; and, softer, and finally, the epiderm is separated from the derm. At some period while these changes were taking place, most commonly towards the end, constitutional symptoms have arisen, manifesting themselves in the larger and softer pulse, and in short irregular rigors, which are felt over the back, down the loins and inferior extremities, &c.

The rapidity with which these phenomena succeed each other, as well as their intensity, depends on the violence of the preceding inflammation, and the extent of the suppuration. If the irritation be slight, and the pus formed in small quantity, the constitutional disturbance will be slight also, and sometimes imperceptible; when, on the other hand, they are considerable, the symptoms attain their maximum of intensity.

If the ulcerative process be suspended before the collection reaches the skin, a permanent centre of irritation succeeds to the violent inflammation, through which the suppuration was first established; the abscess remains unopened, its walls thicken and become the seat of latent or chronic inflammation, the signs characterizing which, are soon shown: the pulse is small and frequent, the appetite fastidious or null, the hands and feet are hot and dry, irregular or nightly sweats break out, and the strength, consumed in the struggle of hectic fever, fails more or less rapidly, in proportion to the extent and situation of the abscess, the sound or deteriorated habit of the patient, &c.

When the physical signs are fully manifested, and they coincide with the remission of the inflammatory symptoms, with a sense of weight in the part, and irregular rigors, there can be no doubt of the formation of an abscess; but pus is often formed without any remarkable manifestation of local or constitutional phenomena, or at least they may be so obscure and latent, as to require the nicest discrimination to detect them. Pus may be formed in the liver, kidneys, mediastinum, mesentery, ovaries, and other internal organs, without any more frank indication of their existence, than that of some vague and indefinite sense of weight, or pain in the part. The obscurity, or even total absence of such indication, is the subject of common remark with every pathologist, as connected with the development of those purulent collections which take place in the liver, lungs, pleura, brain, &c. after amputation, the extirpation of tumours, falls, &c. (See PURULENT DEPÔT.)

In such cases, that is, when the internal organs are the seat of inflammation and the depôt of pus, if the local phenomena are obscure or entirely wanting, we must help the diagnostic by investigating the general state of the patient, and the changes or perversion of the functions of the suspected organ. Under such circumstances, we should take account of the frequency of the pulse, the heat and dryness of the skin, the intensity of the thirst, and examine, according to the case, the manner in which the brain, lungs, the digestive and urinary organs, &c. perform their functions. In spite, however, of every precaution and care in these cases, as well as in those of abscess even of the cellular tissue, at a distance from the surface, or masked by thick and inextensible parts, it will be often impossible to discover the purulent collection. Take, for example, the case of an abscess formed in the deep intermuscular cellular tissue of the thigh; the pain preceding the formation of the pus may be too inconsiderable to attract attention; the swelling, extensive and undefined, tends rather to obscure than elucidate the nature of the case; the skin remains unaltered: the abscess is formed before there is any ground even to suspect its existence.

The obscurity is not removed till the quantity of the fluid becomes considerable, and even then it does not furnish the physical signs of its presence with anything like the same clearness, as in the extensive superficial collection. Pressing the swollen mass at different points with the fingers, or embracing it more amply with the whole hands, will not obtain for the surgeon the same evidence of fluctuation. In such cases, however, there is one indication which we should not fail to look for, viz., the *doughy* state of the soft parts external to the purulent collection. This pasty condition of the subcutaneous cellular tissue, in the absence of well marked fluctuation, is a valuable addition to the other remote, sympathetic, and functional signs of abscess, tending, if the rational signs be also present, to dispel all doubt in diagnosticating deep seated abscess of the limbs, of which it is by some surgeons deemed an almost unerring indication. It will guide us also in discovering, in conjunction with those signs, pus formed, either in the articulations, or in the organs occupying the cavities of the body. The detection of purulent collections in obscure cases nevertheless frequently requires the exercise of great judgment, habit, and tact.

When an abscess has been developed slowly in deep-seated parts, and its investing cyst has acquired considerable thickness, the diagnostic is difficult; the collection may be mistaken for a tumour of encysted, steatomatous, or other nature, and it will only be by taking into account the previous degree of irritation, by seeking to appreciate the fluctuation however obscure, the greater or less defined circumscription of the tumour, and by carefully observing its progressive increase, that the conduct of the practitioner will be most safely guided.

The recognition of pus formed between the interstices of muscle, covered by thick and inextensible aponeurosis, is also a matter of much difficulty; and though local and constitutional symptoms will often run high, the practitioner will still remain much embarrassed, and the more so, as the limiting the ravages which the pus may occasion depends entirely on his promptitude in giving issue to it. If an abscess of this kind be not timely detected, and the matter evacuated artificially, it may occasion irreparable mischief. We must not wait till the fluctuation is unequivocally evident, for if we wait for such an event, or leave the matter to its unchecked course, it will have time to fuse along the tendinous expansions, burrow in the interstices of the muscles, detaching them from each other and from the bones, denude the latter of their periosteum, which it softens or inflames, or arrive at some neighbouring articulation or natural cavity which it may invade. In order to diminish the obscurity which attaches to the formation of abscess under aponeurotic or fascial expansions, it is of the highest importance to the practical surgeon to study carefully the situations, direction, degree of resistance, and the natural apertures of those aponeuroses under which abscesses are observed to take place. Accurate data on these points will give him great confidence in discriminating and predicting the issues in such cases; and for this purpose we cannot do better than refer him to the excellent work of Blandin on this subject.

The difficulty sometimes depends on the mode in which the pus is contained in the parts in which it is formed; as when the containing cyst is very tense from the quantity of the pus, and is at the same time deep-seated; on the other hand, pus is sometimes diffused in the loose cellular tissue, infiltrating its areoles, and not collected into one cavity, or bounded by a distinct membrane; when fluctuation is sought for, it is not detected, the pus is merely displaced and driven into other points, and the surface does not spring up again, but remains pitted as in common œdema; this circumstance sometimes adds to the obscurity of sub-aponeurotic abscess also; instances of this kind will be observed under the pectoral muscles.

Superficial abscess occurring secondarily, or subsequently to inflammation of an internal organ may be sometimes overlooked, in consequence of the attention remaining exclusively fixed on the primitive seat of the inflammation; thus abscess in the perineum, or in the spongy body of the urethra sympathetic with urethritis may be overlooked: the same observation will also hold with regard to cystitis, abscess being here known to occur in the cellular tissue behind the muscles, above the pubis, &c. In such cases the inflammation is propagated from the neighbouring organ to the surrounding or vicinal cellular tissue, suppuration terminates the inflammation in the latter case, while resolution succeeds the former, though the cellular tissue was only involved in the inflammation, secondarily, and as it were by continuity; thus the walls of the abdomen present abscesses after peritonitis, the mediastinum and walls of the chest after pleuritis, the cellular tissue in the cheek or gums after toothache, &c. Abscesses developed externally to serous membranes after effusion has taken place into their cavities, though constituting a distinct disease, are produced by the influence of this same sympathy or continuity.

Abscesses formed in the mucous membranes of the outlets of the body, are in point of facility of recognition on the same level as those formed superficially, such as in the mouth, the lower end of the rectum, vagina, &c.

In phlegmonous abscess, the symptoms may be recognized, and the matter detected almost as soon as formed. We have the reverse of this in the symptomatic abscess; here all is obscure, slow, and uncertain, till the external fluctuating tumour becomes apparent. The tumour itself is not painful nor inflamed, nor is there any expectation of its appearance excited, by any previous sensation acknowledged by the patient; for the pain, heaviness, inconvenience, stiffness, or fulness which may be felt in the parts in which the pus is being formed, are insufficient to awaken suspicion. These however, with difficulty of respiration, dull sound in the lower part of the chest, puffed or swollen abdomen, marked alteration of one or more of the vertebræ, irregular fever, night sweats, and the effects of pressure on the double organs contained in the pelvis, will contribute to show the nature of the case; the collection itself will be rendered more manifest when the patient is in the erect posture; the matter gravitates, and if the course which it has taken in its descent be large and direct, a sensible movement of flux and reflux may be determined by the hand, the undulation being traceable to some extent up the abdomen; its elasticity and fulness are also increased by coughing or straining, or deeply inspiring. On the other hand, if the patient is in the recumbent posture the tumour diminishes. Some constitutions are known to present a sort of suppurative idiosyncrasy, the formation of pus occurring upon the slightest, and often without any ostensible cause. When such a disposition of the economy is known to exist, it will, of course, in doubtful cases, be taken into account in establishing the diagnosis. This disposition is developed in a remarkable manner in some acute diseases, as in confluent variola, gastro-intestinal inflammations, by the suppression of accustomed evacuations in soft, pale, and lymphatic habits.

Diseases that differ entirely from the nature of abscess are liable to be confounded with tumours of this nature. Aneurismal sacs have been opened for abscesses, and an abscess from its contiguity to large vessels, in the axilla and popliteal space for instance, has been left unopened from a fear of its being an aneurismal and not a purulent tumour. Certain physical signs in such obscure cases are of great utility in guiding the surgeon to a correct judgment; amongst others, the conical elevation of the purulent tumour in the middle, and the gradual diffusion or sinking of the base of the tumour at its circumference.

*Prognostic of Abscess.*—Between the two extremes of a superficial phlegmonous speck of matter, and an extensive abscess formed in the depth of our organs, of course there is a vast field to exercise the surgeon's skill in prognostic; the former unimportant, almost imperceptible, and impeding in no wise the healthy action of the powers of life; the latter disturbing those powers, arresting or destroying organic functions, and proving necessarily, and more or less rapidly, fatal. The gravity of an abscess depends on the one hand on its extent, and on the other hand on the nature and importance of the parts in which the matter is formed; frequently this last is the only important consideration, and the abscess proves destructive of life whether it be extensive or not. On this account abscesses in reference to their seat or situation in the brain, lungs, heart, liver, kidneys, all organs essential to life, or in the neighbourhood of such organs, such as infiltrations of pus in the cellular tissue of the abdomen, and of the pelvis after peritoneal inflammations, or operations performed on these parts, are more unfavourable than when they are situated superficially, or in the interior of members or articulations.

The next in point of gravity are those which are symptomatic of a lesion of the vertebræ, the abscess by congestion, and generally all collections, wherever situated, or from whatever cause produced, which are extensive, and which furnish pus in too great quantity. We do not however mean to state, that all abscesses of this kind, or even of internal organs essential to life, particularly when nature prepares an outlet, are necessarily fatal; this would be contrary to experience. But under such circumstances we may affirm, that the cases terminating favourably are not sufficiently numerous to entitle them to be regarded in any other light than that of fortunate exceptions. It is, therefore, wholly impossible to determine in a general manner, whether a patient with abscess by congestion can be surely rescued from his disease by the resources of art or not. The first step towards even a probability in this respect should be grounded on an exact knowledge of the seat and nature of the affection, upon which the abscess by congestion depends. A simple psoitis, although accompanied with extensive inflammation of the cellular tissue, and furnishing matter of a large abscess, but without any constitutional affection of the neighbouring vertebræ, will evidently be attended with much less danger, even though the neighbouring vertebræ be denuded, than when the collection has sprung from a caries of those bones. When the cavity of the abscess is extensive, and its sides altered from the healthy structure, when they have become thickened and cartilaginous, and when the external openings have become fistulous, the drain to which the constitution is exposed from the absence of all disposition in the parts to heal renders the fate of the patient very doubtful. But even under these unfavourable circumstances, amelioration, and ultimate recovery are not to be despaired of. Instances of cure are recorded of Pott's disease of the vertebræ, accompanied with congestive abscess. Several remarkable cases attest the curability of abscess by congestion, under its severest forms. It was observed that the pus was absorbed and replaced by gaseous fluid, which in its turn was removed, and the accidental cavity was obliterated. Dupuytren observed in several subjects, partially obliterated tracks, terminating at the vertebræ, in which he could still discern the debris of tuberculous matter, but the pus had been totally absorbed, and the traces of disease of the vertebræ were alone discernible; and in another case of angular curvature of the vertebral column, in which the bodies of several vertebræ had been destroyed, the whole was perfectly healthy and consolidated; the psoas of the left side was wasted to a mere fibrous cord, the purulent cavity had disappeared without leaving any trace, either of pus or tuberculous matter. Such terminations, however, can only be confidently looked for under very favourable circumstances, and when the abscesses remain unopened; when they become fistulous, the case is all but hopeless. Nevertheless the prognosis is in most cases unpromising, as it requires the concurrence of many favourable circumstances, aided by the efforts of art, to bring about a fortunate termination. The extent of the purulent cavity in the symptomatic abscess adds much to the peril of the patient, although the prognosis is nevertheless to be deduced chiefly from the nature and extent of the primitive affection. One of the most favourable symptoms that can occur in these cases is the resorption of the pus; when this occurs, as it rarely does, the prognosis becomes altogether favourable, for it coincides with a favourable change in the primitive affection which ceases to make progress, and ultimately disappears. When on the other hand the purulent focus is vast, its walls are thickened, its surface chronically inflamed, and its tracks fistulous, the complications become truly formidable, the efforts of art are unavailing, and the patient's doom is all but inevitable. The rapidity with which a fatal termination arrives depends on various circumstances; if the recent openings of the abcess become large and fistulous, and the suppuration abundant; if the caries be extensive, and the abscess spacious and direct in its course outwards, the digestion is soon disturbed, fever is kindled up, nocturnal sweats set in, the body wastes, a colliquative diarrhœa takes place, which cannot be moderated, and the patient expires in the last degree of exhaustion.

The extent or volume of an abscess, in every case, has more or less influence on the result which may arise from it. In an abscess of large volume, the danger will be less in proportion to the mobility of its walls; or, in other words, of their power of constantly accommodating themselves to the quantity or bulk of the purulent matter: but on the other hand if the sides of the abscess be fixed by reason of their connexion with immoveable parts, the access of air into the body of the tumour upon the partial expulsion of the pus is facilitated, a circumstance which acts unfavourably as to the degree of inflammation which follows, the prolongation of the suppuration, and the ultimate cicatrization of the cavity. It has been already noticed that in the abscess of slow formation, or cold abscess as it is called, the walls are comparatively thicker and more distinctly organized than in the hot and rapidly formed abscess; this difference of condition has a marked influence on the progress of the affection. The vivacity of the inflammation in the latter case is, so to speak, extinguished upon the formation of the pus, which being treated as a foreign body and removed by art, leaves the parts well disposed to heal, which they accordingly do very rapidly: in the former the walls are thickened, and even in some instances have become solid and fibrous; while in this state they will not adhere, and cannot do so until such time as a new action shall so change their texture as to fit them for cicatrization.

Superficial collections are less dangerous than those that are deep-seated. Among the latter, however, there are many which have the same advantages in this respect as those which point to the surface, such as abscesses of the throat, pharynx, tonsils, &c.; other abscesses also, although situated in the substance of internal organs, participate in this advantage on account of their proximity or communication with other organs which have a natural outlet to the surface of the body: thus an abscess in the lung may be spontaneously evacuated through the bronchial tube; and in the liver, kidneys, walls of the bladder, stomach, and intestines, a ready and salutary issue is often afforded by the intestinal canal. But as respects the termination of abscesses, the most favourable, as it has been already stated, is that in which the pus is absorbed, as it dispenses at once with any painful surgical interference, and saves the patient from all the consequences of protracted suppurations.

In conclusion, it will be observed that in general the innocuity or danger of purulent collections depends on their volume, situation, progress, &c. But we should not omit to state, that there are instances of abscesses occurring in different parts of the body during the course of acute diseases, particularly in severe fevers accompanied with gastro-intestinal lesions, and in which their appearance has the most marked influence on the progress and términation of those diseases.

These abscesses are frequently indicative of, and are a consequence of, a change in the irritation prevailing in important organs; and when such is the case, their appearance is eminently salutary, except when the abscess is formed in an organ essential to life. Examples of this species of abscess denominated critical, occur under the strong sheath of the parotid gland in gastro-encephalitis, about the angle of the jaw, in the ear, in the groin, in certain mild cases of the plague, in the axilla, &c. These critical abscesses are accompanied with marked remission of the previous symptoms. On the other hand, when they do not coincide with a transfer or cessation of the irritation from the organs already labouring, they constitute a formidable feature of the case.

*Treatment of Abscess.*—The curative indications of abscess may be, to a certain extent, inferred from what has been already laid down in the preceding part of this article; the terminations, as it has been already stated, are, 1st, The spontaneous absorption of the matter; 2nd, Its evacuation through ulcerous openings. But it may also happen that the pus may remain stationary in its cavity, abstracted as if it were a foreign body, isolated by an accidental cyst from the living actions of the economy; this, however, is not a termination, but rather an indefinite protraction of the disease, which sooner or later will require the aid of art to effect a cure: in this state, absorption of the matter may be promoted by the application of a blister to the tumour.

When nature is left to her own resources, she relieves the parts from the matter which distresses and impedes their functions by one or other of these modes; and when art interferes, it cannot do otherwise than imitate her. The precise line of conduct which the surgeon may adopt in any given case, must mainly depend on the judgment he may form with reference to all its circumstances. But his efforts are limited to the excitement of the process of absorption on the one hand, or to the evacuation of the pus, and the providing for the adhesion of the parts by proper internal treatment and dressings on the other.

*The matter of an Abscess is sometimes absorbed.*—An abscess, when left to itself, like serous effusions in the natural cavities, or infiltrations in the cellular tissue, will sometimes be dispersed; the pus is absorbed either slowly or rapidly, the cavity in which it was deposited is effaced, the fluctuation of the fluid and the tumour which it formed can be no longer recognized. The process is effected by the sole and unassisted efforts of nature, with or without any remarkable phenomena; or while the abscess disappears in one place, another forms in a distant part; or finally, the resolution of the local inflammation, and the absorption of the matter, are accompanied by some sudden and remarkable evacuations, such as diarrhœa, copious urine, depositing abundant sediment, viscid and odorous sweats, &c.: such cases are not unfrequent.

As resolution is the best termination of inflammation, so is resorption the best also either of purulent collections or of serous effusions; and whenever any reasonable hope of such an event can be entertained, from a due and salutary excitement of the powers of the economy, it should not be lost sight of. Allusion has been already made to the case observed by Mr. Wilmot, in which the pus of a psoas abscess was absorbed, and in which every trace of induration was finally dispersed by the use of a bandage and compress wet with a strong decoction of oak bark and alum. Mr. Crowther has also been successful in dispersing large collections of matter without opening them. When the surgeon aims at effecting the absorption of the matter, he employs, according to circumstances, internal or external remedies, or both conjointly; for the former, purgatives, diuretics, diaphoretics, alteratives, emetics, etc.; for the latter, frictions, with various stimulating substances, as iodine, muriate of ammonia, mercury, local bleeding with leeches, blisters, cold or hot effusions with simple or mineral waters, hemlock, bath, good air, &c. This imitation of nature is, however, at best but a gross one; for while she, for the most part, effects her purpose without much observable commotion, art can only produce a similar result by momentarily perturbing the actions of the economy.

It is not by any means an easy matter to determine in what cases the surgeon ought to endeavour to promote the resorption of the matter; but nevertheless we may state generally in what description of cases such an event has been observed to occur, either spontaneously or by the effect of internal or revulsive medication. The resorption of matter takes place most commonly from abscesses formed in the lymphatic ganglions. In such cases, internal medication may be attended with salutary effects; but the practitioner should proceed with great caution, and hold himself ready to resign his hopes of succeeding in this point as soon as his first efforts to effect the dispersion of the abscess are found to be fruitless, and particularly if the stomach and bowels are too highly disturbed or irritated by the action of the medicines employed.

External applications are observed to be most successful in the case of chronic abscess where the inflammation is moderate; in such cases, iodine, muriate of ammonia, affusions, mercurial frictions, flying blisters, &c. may effect the dispersion of the collection; but here again, our conduct must be cautious, for if they do not conduce to the end in view, they may render the local inflammation more active, and thus tend to the spontaneous opening of the tumour contrary to the wishes of the surgeon. On the other hand, the matter will in some instances be absorbed, while the treatment is directed to the maturation of the collection with a view to artificial or spontaneous opening. Thus while the surgeon is combating the local pain, redness, heat, and tension by means of local bleeding, emollient applications, &c. the tumour diminishes, the fluctuation becomes less and less distinct, and the matter is absorbed. This event, however unlooked for, is nevertheless easily accounted for. Doubtless the continuation of the local stimulation which first gave rise to the purulent collection is one of the chief causes of its gradual increase; for as long as it possesses any great degree of intensity, the cyst of the abscess remains vascular, tense, and painful, and its exhalation is continually adding to the quantity of pus already formed: the quantity and rapidity of this exhalation bears the same direct relation to the intensity of the local irritation, that the absorption of the matter, when it occurs, does to the abatement and final extinction of the inflammatory action in the tissues surrounding the pus. Under the influence of simple antiphlogistic treatment of the case we are now contemplating, the balance between exhalation and absorption is turned in favour of the latter, and this condition being maintained by persistence in the antiphlogistic action, the pus is gradually removed, and the cure is obtained spontaneously. One word will suffice to expose the advantages arising out of the antiphlogistic course. When the inflammation runs high in the walls of the purulent cyst, the cyst treats the contained fluid as a foreign body, from which it seeks to be relieved, but if the local irritation be appeased, the pus is not so irreconcileably offensive to the powers of the organism, is not treated necessarily as a foreign body, but may be absorbed. Examples of the dispersion of abscess are not few, more particularly in the lymphatic ganglions, and in articular inflammations. But whether the absorption of the matter be effected or not, the effect of the antiphlogistic treatment on the abscess is in itself useful and salutary; when such treatment of abscess is adopted and steadily followed out, the wall of the abscess is less vascular, less disposed to be excessively distended, the matter is better circumscribed, and when evacuated, the surrounding parts are more susceptible of speedily reuniting. If therefore this plan has been resorted to before any fluctuation is perceptible in the tumour it will not be improper to persevere in it, even after the matter is formed. The propriety of this mode of treatment will be still more obvious, if we suppose a case in which the previous local irritation, being moderate, the progress towards suppuration is slow, and matter is formed in the centre of the tumour, while its circumference presents still an engorged and hard circle. In such a case, the maturation of the abscess, and preparation for its speedy cicatrization, will be best provided for by local depletion, emollients, &c. The original irritation, as well as that still kept up by the presence of pus, and the engorgement of the surrounding tissues, upon which the reaccumulation of the matter so mainly depends, will thus be most efficiently combated. The same reasoning, resting upon the same data, obtains, in relation to the absorption of the matter in the symptomatic abscess; for when in consequence of diseased bone, either in a vertebra, or the articular head of a bone, matter is formed and directed in various courses towards the surface, the abscess is but a complication added to the primitive affection, a consecutive extension of the inflammatory process into new tissues: but if it was deemed proper before the pointing of an abscess in a distant part, that the primitive affection in the vertebræ, or the articulation, should be combated by the insertion of issues on each side of the spinal column, or in the neighbourhood of the joint, by blisters, rest, and the exhibition of internal remedies suited to the constitution of the patient, the formation of the consecutive abscess would form no just ground for departing from a plan of treatment upon which the cure, and the absorption of the matter itself, may ultimately if not wholly depend. The formation of matter, therefore, in a part which is suffering from irritation, which may have been combated by capillary depletion, furnishes no indication against the continuance of such treatment; a counter indication to the practice can only arise from the general state of the patient.

There are two kinds of abscesses which are little or not at all disposed to this sort of termination: the one, the acute and rapidly formed abscess, accompanied with all the inflammatory phenomena in a high degree; collections of this kind quickly point, and either burst, or require evacuation: the other, the chronic abscess with thickened cyst. This condition of tissue must be modified by a different mode of stimulation, before agglutination of the sides of the abscess can take place. In some subjects, who have been enfeebled by disease, or in whom the lymphatic temperament prevails, there appears to be a ready disposition, a diathesis, to the formation of pus. In such cases, the facility with which the pus is resorbed is quite as remarkable as that with which it is formed, and all the secretions concurring in the elimination of the matter, seem, while the process is taking place, to put on a puriform character. A secondary irritation supervening in the secreting surfaces or organs, the slight local irritation which preceded the formation of the matter seems to be extinguished, the collection is dispersed, and the matter is eliminated by the ordinary channels of the economy.

There are, besides, certain circumstances which should have due weight with the surgeon, even when he does not entertain the hope of being ultimately successful in effecting the absorption of the matter; it will not for example be proper to open an abscess, when once the matter is formed, in a person of decided lymphatic or scrofulous habit, without beforehand employing such general and medical treatment, as will usefully modify such constitutions. The evacuation of the matter in these cases is subordinate to the restoration of the vital energies, and will be attended with the best results, only when the general amendment of the patient shall have been fully provided for.

*Opening of Abscess and subsequent Dressing.*—Let us now suppose that all our efforts to prevent the formation of matter, or to procure its absorption when formed, have been fruitless; the question of the time and mode of opening the abscess naturally arises, and is of considerable importance, as certain abscesses require to be opened before they are matured, while the evacuation of others may be beneficially retarded.

The opening of an abscess is urgent, nay cannot be safely delayed, when it has been produced by the extravasation from their natural reservoirs or channels of the soft or fluid secretions of the body, such as the urine, fæces, blood, tears, saliva, milk, bile, &c. (see URINARY AND STERCORAL ABSCESS.) The termination in such cases is but a mixed state of suppuration and gangrene. The surgeon must quickly prevent the extravasating matter from extending to parts still sound, at the peril of seeing the integrity of those parts, and life itself destroyed. Mention has been already made of the gravity of certain abscesses developed in the walls of the great visceral cavities, in the groin, under the pectoral muscle, and in the vicinity of the great articulations; to these may be added, collections in the neighbourhood of the larynx, pharynx, and trachea, which impede the free functions of respiration and deglutition. When matter is formed under the strong fibro-cellular fascia, behind the sterno-cleido-mastoid muscle, the strength of this fascia is so great, that the matter is pent narrowly up, producing excessive tension and pain, and the pus must fuse under the clavicle, towards the upper part of the chest or axilla. An early evacuation in all such cases is obviously desirable, and even necessary, to save the patient from the danger of irruption into the internal cavities, or from the imminency of suffocation. In the same order we should also class those collections, which, being accompanied with high inflammatory phenomena, are developed rapidly in parts abounding in the adipose and cellular element, such as the vicinity of the rectum, the margin of the anus, the groins, the axillary and popliteal regions, the sides of the neck. Irritation, arising in the cellular tissue, finds every condition favourable to its propagation, and thus is speedily extended; to prevent, therefore, those unlimited denudations, those *suppurative* dissections of parts, an early opening is absolutely indispensable. It is a matter of common remark, that an abscess is slow in pointing externally in proportion to the extent of loose cellular structure in which it is allowed to fuse unopposed. These cases require, in a special manner, to be treated by soothing applications and local depletion.

In so far the conduct of the surgeon is easily dictated; but the indications for early opening may be in the highest degree imperative, while the symptoms are so obscure as to give rise to considerable embarrassment. We have often seen experienced practitioners hesitate in these circumstances, and not unfrequently, upon a too hasty decision, open tumours in which not a drop of pus could be detected. The obscurity in such instances may depend, as has been already stated, upon the matter being deeply-seated, and masked by unyielding aponeurosis, and great circumspection and tact are necessary to enable us to form a right judgment; account should be taken of the degree of the preceding inflammation, the functions that may have been disturbed, as connected either with the supposed seat of the matter, or as appertaining to the constitutional phenomena characteristic of its formation, the doughy condition of the parts, the ill circumscribed state of the tumour, and the fluctuation itself, however obscure, before the incision of the parts is made. These cases occur most commonly in the interstices of the muscles of the thigh, the arm, the fore-arm, the sole of the foot, and in the tendinous sheaths (see Thecal Inflammation); the importance of limiting the ravages, perhaps irreparable, which the pus would make if it remained undiscovered, is sufficiently great to challenge the highest and most careful exercise of patience, tact, and skill the surgeon can bring to the consideration of the case. As soon as the anterior signs, the cellular *empâtement*, and a feeling of fluctuation, though obscure, are all present, he is justified in making his incisions, to prevent the more serious mischief which might arise from delay, although the depth of the matter from the surface may be considerable.

Another motive for the early, and even premature opening of an abscess, will be found in the case where its progress is attended with intolerable pain, great constitutional disturbance, and even convulsions, loss of appetite, sleep, &c., and when, from the nature of the parts abounding with nerves and blood-vessels in connexion with aponeurosis and tendinous sheaths, or the violence of the inflammation, there is excessive tension and danger of strangulation of blood-vessels and nerves, and gangrene (see Anthrax); or when the compression of large vessels, such as the jugular veins, threatens suffocation, or cerebral congestion. In such circumstances the chief consideration is to shield the patient from peril, whatever may be the inopportunity of laying open the collection, as regards the tumour itself; as to wait for the maturation of it might be tantamount to sacrificing the patient's life. In such cases, opening a way for the matter will not be sufficient; the dangerous tension of the parts must be relieved by free incisions.

Much caution is also requisite in the treatment of abscess, formed in visceral organs, contained in the natural cavities of the body, which points externally; for if it be an object to evacuate the pus, it is still more important to prevent the escape of the matter into the cavity in which the suppurating organ is contained; an event which can only be insured by deferring the evacuation until the adhesions, which cut off the communication with the serous cavity, are fully established. The evidences of this adhesion will be found in the active sympathy of the skin with the suppurating organ; it becomes painful, hot, tense, red, and distended, and its centre points.

In general, it may be laid down, that chronic abscesses, with thickened walls, should be opened when, in spite of the previous treatment, they show a disposition to extend; cure by the absorption can no longer be expected, the matter must be evacuated, and the sooner it is done the better.

The opening of congestive or symptomatic abscess does not exactly fall under this general rule. We have said already, that the fatal issue in such cases is in general hastened by the opening, and the admission of air into the cavity of the abscess; at all events, the formidable character of the symptoms and rapidity of their march most commonly date from that period. It is, therefore, desirable, while general treatment is directed to the cause of the disease, that the period of opening should be put off as long as possible. But while we seek to secure this advantage, we must be mindful that we do not obtain it at too great a sacrifice. We should not, through dread of the consequences of opening, defer it until the pus has burrowed to a great distance, and the covering of the abscess becomes so thin, as to threaten an extensive rupture. In this case, opening does not mean entire evacuation. Dupuytren prefers even an early opening, to allowing an unlimited extension of the abscess, and states, on the authority of numerous cases, that an opening may be made in the early stage without any great risk of serious consequences: the opening after some time becomes fistulous, and furnishes a favourable exit for the pus and osseous debris. But the chances of so favourable an issue depend much on the good state of the patient's bodily health, the integrity of the strength and appetite, and the smallness of volume of the abscess.

When he used to treat symptomatic abscess in this manner, he always insisted, in a special manner, that there should be no suspension of the means directed to the cure of the primitive lesion of the vertebræ, or articulations; and this, perhaps, will go far to account for the successes he speaks of.

*Modes of opening Abscesses.*—When purulent collections occur in the tonsils, pharynx, behind the walls of the œsophagus, of the glòttis, and even in the larynx, they may be sometimes evacuated by the use of an emetic, as those occurring in the course of the intestinal canal, particularly near the rectum, may be by the administration of a purgative. When the wall of the abscess is thin upon the mucous membrane of the œsophagus or rectum, the commotion produced by the efforts of vomiting or purging will often suffice to effect the bursting of the abscess; the cure immediately follows. But though many reasons, such as the inaccessibility of the abscess, or the pusillanimity of the patient, may induce us to give a trial to an emetic, in such cases we should, nevertheless, when there is any counter-indication to this plan, arising out of the state of the patient's health,—if there be irritation of the stomach, marked by dryness and redness of the tongue,—it should be most carefully avoided; for this would be but incurring a great risk for an uncertain good. But when the tongue is soft, large, and slightly coated, the mouth and pharynx foul with thick viscid mucus, and there is no sensibility at the epigaster, then there is a prospect of the action of the emetic being followed with good effect. It should be added, that the bursting of abscess in the mouth, pharynx, and rectum, is not unfrequently promoted by gargles and lavements. The emollients in these cases act in the same manner as the maturative, employed in subcutaneous abscess to hasten the arrival of the matter to the surface, by the softening of the skin, and the stimulation of the purulent cyst.

When the suppuration is fully established, and shows a tendency to accumulate rather than to be resorbed, it will be the surgeon's duty to evacuate the matter, and for this purpose several modes may be employed; that by incision being by far the most expeditious, simple, and generally employed.

The instrument most commonly employed for this purpose is a spring-opening bistouri, as it possesses several advantages in respect of solidity and the capability of being wielded, over the abscess lancet, which is now but little used in any case. The mode of performing the operation is very simple (see INCISION for a more minute description). The situation in which the opening should be made, as well as the extent and number of them, will vary according to the circumstances of the case; in general, however, they should not be so long or deep as the older surgeons were in the habit of making them; for independently of the deformity of a large cicatrix, the speedy healing of the abscess is rather retarded than hastened by those unnecessarily extensive divisions of the whole superficial paries covering the collection of matter. However, when an abscess is deep-rooted, the incision must of necessity be extensive; the object being in these cases to secure a sufficient opening for the exit of the matter without fear of its closing up too soon.

In general it will be proper, whenever practicable, to make the opening at the most depending part of the collection, in order that its own weight may favour its evacuation. But this will often be impossible; for in some instances an extensive abscess will have ripened and pointed in the centre, while the matter, at its most depending point, is still at a considerable distance from the surface. In such a case, the opening may be made where the abscess has pointed, care being taken when the dressings are changed to prevent lodgment of the matter, by pressing upon its circumference and lower part in particular. When the collection, for due motives, is opened at its thinnest and most prominent, and not at its lowest point, the inconvenience may be remedied to a great extent, when it is possible, by position aided by gentle and gradual compression, making the matter tend towards the opening. But when this cannot be effected, and still more especially when the purulent cavity is irregular, ramifying amongst the resisting parts, thus forming smaller cavities having but narrow connexions with the parent focus, it becomes imperative to make multiplied counter-openings, under the penalty, if neglected, of the retained pus becoming stagnant and decomposed; in which condition it loses all relation, however remote, to the living parts, reacting upon them as dead deleterious matter.

The absorption of this putrescent fluid, differing *toto cœlo* in its qualities from pus, is speedily followed by fever, loss of appetite, diarrhœa, rapid wasting; the sources of nutrition are stopped, and the patient falls into extreme marasm. These counter-openings should be made as soon as the necessity for them is discovered, and should be numerous enough to obviate every impediment to the free exit of the matter. They may be made either by pressing the pus into each of the small cavities, and dividing it with the bistouri, when thus swelled up with matter, or by passing a director or female sound into the superior opening until it reaches the bottom of the cavity, when the wall is divided on the point of the instrument. The effect of this practice is speedily manifested; sleep and appetite return, the system throws off the putrid poison it had been imbibing, and the healing process sets in in the upper abscess.

The dressing after an opening has been made is by no means unimportant. When the irritation is still unabated, it will be highly useful to allow the wound to bleed, and the abscess to unload itself, before any dressing is applied; the walls should not be pressed painfully in order to force the matter out, as this would tend to keep up irritation, and could have no good effect. Whenever the engorgement of the purulent cyst or surrounding parts is considerable, which is always the case when circumstances compel the premature opening of the abscess, the parts should be covered with cataplasms or other emollients. This treatment is principally indicated in the acute abscess.

How opposite our treatment in chronic

and symptomatic abscess! A large opening in the case of a symptomatic abscess would not fail to induce all the bad consequences of the sudden introduction of air within an excitable and extensive cyst. A different mode of opening, namely, by successive small punctures is therefore adopted in such cases. But even here there is some variety in the mode of making the punctures. Some practitioners use a needle, the same as that employed in evacuating anasarcous collections of the limbs, scrotum, &c., or a cataract needle; in the latter case, a cupping glass is placed over the small puncture in order to pump out the matter, at the same time that it prevents the access of the air. In the Hotel-Dieu of Paris, the puncture is made with a thin-bladed bistouri. The skin is drawn on one side so as to be rendered tense in the part where the puncture is to be made; the retraction of the skin is kept up until the quantity of matter desired is evacuated; it is then relaxed, and, regaining its natural position, the opening made in it no longer corresponds with that of the cyst. By this method the jet of pus is of tolerable volume, and can be stopped as soon as the bulk of the tumour has fallen a little. The period for repeating the puncture will depend on the rapidity with which the pus is exhaled; the proper time will be when the tumour has again become tense. It is important when the matter has been drawn off, that the little orifice shall be properly closed: the adhesive plaister used for this purpose should be fresh and good, and should be placed double on the opening; and once placed it should not be removed, but rather be allowed to fall off. It will contribute much to a favourable issue, if the air can be perfectly excluded, or admitted only in such small quantities as gradually to accustom the interior of the cyst to its presence. It will happen upon the first, second, or third puncture that the cyst becomes irritated, painful, and tense, accompanied with constitutional disturbance, colic, diarrhœa, and vomiting; but these symptoms are much less intense and obstinate than when the air has been suddenly and largely admitted; they soon yield to proper treatment, local and general, and become less and less manifest at each successive puncture. While this is taking place, the maintenance of the general health, the gradual diminution of the tumour at each successive puncture, and the progress of amelioration in the primitive lesion, inspire hope of a favourable termination. Sooner or later, however, whether we have to deal with a large chronic abscess or a symptomatic collection, the period arrives when the small orifice resulting from the puncture will not heal; it remains open, and is often enlarged by breaking into one or more of the preceding ones. The advantage of the treatment by successive punctures will then be evident. Had they been delayed till the collection thinned the surface and burst extensively, the symptoms of reaction consequent upon the free admission of air would not only be intense, but in all probability incontrollable for the future; but thus in a manner habituated to, and prepared for its impression, the walls of the cyst are less susceptible of a high and baneful excitement, and the constitution of the patient is not perilled so much by the suddenness and severity of the shock. Nor is this all; for as the procession of the symptoms is hereby checked, there is time to combat for success against the constitutional lesion in which the abscess originated. This method receives extensive application in the French hospitals, being preferred in cases of empyema and other analogous collections, as well as in that of symptomatic abscess. Purulent collections are also sometimes evacuated by passing a seton through the tumour which they form; and this with a view to the slow evacuation of the fluid, as well as to excite a healthy action in the walls of the cyst. The practice is grounded on the notion that the *mèche* introduced into the wound permits a capillary oozing out, of the pus, while its volume prevents any sudden or considerable flow of it: but this will be the case for a short time only. The engorgement of the small orifices occupied by the *mèche* soon subsides, and the matter escapes continually and without further check; the *mèche* soon comes into painful contact with the lining membrane of the abscess which it irritates and thus retards, or opposes the cicatrization of the cavity. The operation itself, as well as the subsequent dressings, are besides very painful, while the treatment is more protracted, and the cure is not more certain than by incision.

In some rare cases, it may be necessary to employ a trephine to liberate the matter of an abscess. M. Roux relates a case in which a collection of matter within the cranium was indicated by an external abscess, which communicated with it through a perforation of the bones of the skull; this may happen, according to this surgeon, whether the primitive collection has been formed between the cranium and dura mater, or whether it is circumscribed in the cavity of the arachnoid. The patient, upon whom M. Roux applied the trephine with success, was seventeen years old; the abscess of the arachnoid had existed four years, under the right parietal bone, and communicated externally through an ulceration in the dura mater, and an opening in the parietal bone: there was a fistulous opening of the soft parts. In this case, however, it should be remarked, that M. Roux had not to contend with the obscurity and uncertainty of diagnosis which commonly exist in cases of abscess within the cranium, (see HEAD, TREPHINE,) and which must forbid the practice. The application of the trephine may be also required in cases of abscess of the mediastinum. Matter formed in the mass of cellular tissue, between the cavities of the pleura, will not only betray its presence by fever, and wasting, and by the impediment it creates to the functions of the heart and lungs, but also by its working out at the sides or inferior part of the sternum, wearing its way through the bone itself. But the pus must have actually shown itself, before we should resort to the application of the trephine; the mere rational signs, such as the dull sound under the sternum, the dyspnœa, the doughy condition of the integuments, the hectic fever, nightly sweats, and other symptoms indicative of internal irritation will not be sufficient, because they may be characteristic of very different affections. Another mode of opening is that by caustic; the necessity for employing it arises from particular conditions connected with the origin, the situation, or the state of the purulent collection. In the case of an abscess, originating in an organ contained in the splanchnic cavities, and pointing externally, if the integument be not sufficiently inflamed to satisfy us that adhesion has been firmly established between it and the serous membrane, the opening should not be attempted by any other mode. These observations apply more especially to certain abscesses of the liver and gall bladder. When the caustic is applied, and the adhesions are not sufficiently organized, the inflammation it excites hastens and completes the process of their formation, so that before it bursts forth, there is no longer any thing to be apprehended from the extravasation of the matter into the cavity. (See Abdomen.)

In certain glandular inflammations of the groin and axilla, when the whole tumour is completely softened, and the skin seems to have lost the support of the subjacent cellular tissue to a great extent, it is often advisable to open the collection by means of caustic; this method is adopted in the case of venereal bubo at the Hôpital des Vénériens in Paris. In the chronic abscess of limited extent, the practice is also advantageous. The caustic generally employed is the potassa fusa applied in small quantities over the abscess, in the same manner and with the same precaution to prevent its spreading, as in the case of the insertion of an issue. (See Caustics.) The time during which the caustic remains applied, and the quantity of the caustic must be according to the extent of opening desired, and the expedition with which it is deemed advisable to empty the collection. In the case of the small chronic abscesses, accompanied by feeble marks of inflammation, it will be proper to wait for the matter till the eschar drops off of itself; in the meanwhile, it determines a salutary irritation in the purulent sac, which is much more disposed to cicatrize as soon as it is emptied, than it would otherwise have been. The same mode of irritation is attended with similar good effect when excited in the skin, which has been so thinned by the progress of the abscess as to be almost entirely deprived of its nutrient vessels. In these cases when incision is had recourse to, the thin skin often perishes, or refuses to cicatrize with the bottom of the tumour, and the surgeon is obliged to remove it, by painful resection, followed by tedious suppuration before the wound can be cicatrized, and when cicatrization takes place the scars are unsightly. (See Cicatrix.)

Sometimes the persistence of the suppuration, and the impossibility of healing an abscess, depends on the irritation of a foreign body pent up in the suppurating cavity. It should be sought for and immediately extracted. In other cases, the wasting of the patient is so great, that surfaces, otherwise sufficiently disposed to unite, continue their suppurative action from mere absence of contact, or from the immobility of the parts with which they are connected. Instances are seen in the fistulous openings which are thus kept up in the popliteal and axillary regions, at the margin of the anus, &c.: the cure here is promoted by generous diet, good air, moderate exercise, &c. Suppuration is often sustained solely in consequence of a cachectic, or general bad state of the patient. In persons of lymphatic or scorbutic habits, or who have suffered from long continued mercurial action, the respiration of deleterious gases, &c., suppurative action is easily excited in a wound, and prolonged without any appreciable cause. In these cases, the suppuration itself is of little importance, and the cure is best effected by such hygeienic and medical management as is best calculated to remedy the particular organic vitiation, on which the persistence of the suppuration depends. The whole organism must be healthily modified, before we can excite it to the formation of those adhesions of which it seems to be incapable, and upon which the cure depends.

But whether the opening of an abscess takes place spontaneously, or by one of the artificial modes above alluded to, the subsequent treatment is very simple. True, it may be advisable to enlarge the spontaneous opening when too small, but the treatment in either case will be the same; and not taking account of lesions of remote and important organs upon which an abscess may depend, the local treatment consists only of cleanliness, and the free exit of the matter. The duty of the surgeon now is to provide for the gradual evacuation of the matter, and the successive approximation of the walls of the cavity in which it had been formed; the agglutination of the lips of the wound or orifice must therefore be prevented; this is done by the insertion of a small pledget of lint smeared with simple ointment: it however should not plug up the opening, but be loose enough to permit the gradual escape of the matter. If on the other hand, the sides of the orifice remain parted from each other, the dressings may be flat, and so arranged as to afford a certain degree of support, which may be gradually accommodated to the diminution of the cavity until it at last becomes so wholly compressive as to hasten the cicatrization in a remarkable manner.

Such are the general rules which will be found applicable in the treatment of purulent collections; the particular rules to be observed in the management of local abscesses will be found under their respective heads.

It will be now necessary to notice certain abscesses occurring in particular situations, for which no distinct place is set apart in this work.

We stated at the outset that purulent effusions in the natural cavities did not come within the strict sense of our definition of the word abscess. But purulent collections are formed in the natural cavities, whether mucous, serous, or articular, and in such a manner as to present all the true characters of abscess. There is a striking difference between the matter of those effusions which take place in serous cavities, and that of an abscess properly so called. The nature of the fluid is different from that of true pus, and seems to be composed of serum, mixed up and made yellow by coagulable lymph, or the matter of false membranes (see Empyema). In the case of the true abscess, the cavity is far from being co-extensive with the general cavity in which it happens to be formed; the collection occupies but a limited portion of the cavity, being circumscribed by adhesions, or membranous partitions whereby the isolation of the matter is as perfect as that of an abscess developed in the cellular tissue alone. Treating of purulent collections developed in these situations, it is merely for the convenience of phraseology, that they are spoken of as being formed in the natural cavities, for the cavity in which the pus is formed does not belong to the natural one, having been cut off from it by the adhesive process.

*Abscess in serous membranes.*—In serous membranes the formation of matter is always partial, owing to the rapid production of the adhesions above-mentioned. Abscesses of this kind are formed frequently in the pleura, peritoneum (see Abdomen), and in the arachnoid. Matter confined in the pleura may be evacuated, either by the corresponding surface of the thorax, through the intercostal spaces; or internally through the substance of the lung, until it is evacuated by the bronchi; those of the peritoneum, through the abdominal walls, or through the intestinal canal; and mention has been made of a case in a preceding part of this article, in which the pus made its way through the bones of the cranium. (See Head.)

*Abscesses in mucous cavities.*—Abscesses may be formed in the walls of mucous cavities, as in the stomach, bladder, &c.; but they are far from favouring, to an equal extent, as the serous membranes, the formation of the small, limited, purulent focus. When, however, the outlet of a mucous cavity is small, or obstructed, it may not only become the seat of an abundant muco-purulent secretion, but even of the true abscess. We have examples of this mode of suppuration in the maxillary and frontal sinuses (see Ozæna), in the cavity of the tympanum (see Ottitis), in the mastoid, and ethmoid cells, and sometimes in the lachrymal sac.

Various denominations, according to the situations of abscesses, will be found in authors; such as *empyema*, when in the pleura, *vomica*, in the substance of the lungs, *hypopyon*, in the anterior chamber of the eye, *panaris*, in the fingers, *bubo*, in the groin, &c.

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(*Wm. B. Costello.*)

ACANTHABOLOS, from ἄκανθα, a "spine," and βάλλειν, "to cast out," a kind of forceps used to extract extraneous bodies from the windpipe, from any cavity, or from wounds. It is mentioned by Paulus Ægineta; Fabricius, ab Aquapendente, and has been described by Scultetus.

ACCIDENT, *accidens*, Lat., *Zufall*. G. in its ordinary and extended acceptation, means any fortuitous, or unforeseen occurrence. The progress of pathology in the hands of our laborious neighbours, the French, has given a new and more limited value to this word. In their works, it signifies, in a general manner, symptoms, or *ephinomena*. It is used chiefly, though not exclusively, to designate symptoms of an unexpected kind, which occur in, and disturb the usual course of a disease.

ACCIPITER, *épervier*, Fr., ἱέραξ, 'the hawk;' a bandage applied over the nose; so called from its resemblance to the claw of the hawk. It is figured in Galen, and others of the older writers. It resembles the T bandage described under the head *Confining bandage*, and which is designed for the same purpose. (See Bandage.)

ACCOUCHEMENT, lying-in. (See Parturition.)

ACEPHALOCYST, from α, and κεφαλή, head, and κύστις, bladder: a bladder without a head. (See Hydatid.)

ACETUM, Lat., ὀξὺς, Gr., *vinaigre*, Fr., *Essig*, Ger., *vinegar*, Eng.—It is obtained from the distillation of wood; or, in a state of concentration, by decomposing an acetate, and receiving the acetic acid by distillation. In this state it is highly volatile. It has been used by Bonvoisin, in Italy, as a vesicant, and rubefacient, and in cases of sudden inflammation, such as croup, where expedition is an object, it affords a valuable resource for producing almost instantaneous vesication. For this purpose it is applied, by means of blotting-paper, or fine cambric. The vapour of concentrated vinegar, being highly stimulant, is used to the nostrils in head-ache, languor, fainting, and asphyxia. When employed for this purpose, its pungency is moderated by the addition of a small quantity of powdered sulphate of potass, sufficient to moisten the salt. To neglect this precaution would expose the person smelling the pure acid to high inflammation of the mucous membrane of the nostrils and of the frontal and maxillary sinuses. It is successfully employed as a caustic in destroying warts, and other indolent growths from the epiderm. Several acids are employed in surgery, of the properties of which we shall speak under the names of the bases to which they are united. Acetic acid forms the basis of oxycrat. Diluted with water, it is often useful in checking an inflammation which threatens to supervene from blows, falls, and sprains.

ACHILLIS TENDO, *funis Hippocratis*, Lat.; *tendon d'Achille*, Fr.; *Achillesflechse*, Ger. The strong flat tendon common to the gastrocnemii muscles, which is inserted into the os calcis. It is generally well developed in dancers, and good pedestrians. It derives its name from Achilles, who was wounded in this part at the siege of Troy; this tendon was, according to Homer, the only vulnerable part of the warrior's body, he having been dipped, by his mother Thetis, in the river Styx. The tendo Achillis is sometimes ruptured. (See Tendons, rupture of.)

ACIA, from ἀκή, a point. Commentators are not agreed as to the exact sense in which this word was employed by the ancients. According to some, it meant the needle, or the thread, and to others, a particular kind of suture; "*acia mollis, non nimis torta.*"

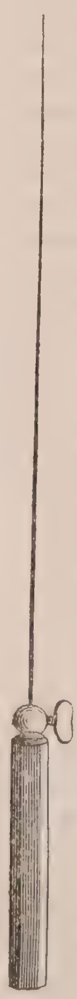
ACOLOGY, a term employed by some German writers to designate that branch of surgery which treats of surgical instruments. (See Instruments, Surgical.)

ACTUAL CAUTERY. The term 'actual' means that which acts suddenly, or instantaneously. The words, 'actual cautery,' are applied to iron at a red or white heat, or to heated liquids, and contradistinguishes this mode of cauterizing from the 'potential,' or virtual, which is not immediate in its action. (See Caustics, Cauterization.)

ACUPUNCTURE (from *acus*, a needle, and *punctura* puncture) is a medico-chirurgical operation, which consists in the introduction of needles, to be hereafter described, into many different parts of the body. Acupuncture has been practised from time immemorial amongst the Chinese and Japanese, from whom it was introduced into Europe a century and a half ago by Ten-Rhyne, a medical officer in the Dutch East India Company's service, and who had resided some time in Japan. Mention of it first occurs in the medical literature of Europe, in a *Thesis de Arthritide*, published by him in London, in 1693. Additional information on the subject was contributed by Kœmpfer, in his *Amœnitates Exoticæ*, in 1712. It was again noticed by Dujardin, in his *Histoire de la Chirurgie*, in 1774, and by Vicq D'Azyr, in the *Encyclopédie Méthodique*, who speaks of it, among other means of irritating or stimulating, "as capable of calming violent spasms, and restoring sensibility in organs, in which this function is weakened." Notwithstanding, it did not obtain any credit as a therapeutic agent, till Berlioz made trial of it in 1810, in cases of neuralgy; and made known the results to the Academy of Medicine. His views respecting the value of acupuncture, with several cases in which it was successfully employed, are recorded in his work on *Chronic Diseases, &c.*, published in 1816, at Paris.

No one, however, seemed as yet prepared to adopt the recommendation of Berlioz. Some years after, Dr. Haime of Tours, into whose hands an account of Berlioz's cases had fallen, and Bretonneau, about the same time, made numerous trials of its safety and efficacy. Haime's cases were published in 1819, in the *Journal Universel*. In England, Mr. Scott, of Westminster, and Mr. Churchill employed it; the former published his results, and a short account of the mode of performing it, in 1821. Hitherto, however, it has been more extensively employed by M. Jules Cloquet, than by any other practitioner; his views on the subject, have been published by Dr. Dantu, one of his pupils, at the Hôpital St. Louis. In St. Thomas's Hospital, I have applied it extensively in cases of rheumatism; the results were published in the fourteenth volume of the *Medico-Chirurgical Transactions*.

The needles employed should be very slender, and sharp-pointed, and furnished with a head of ivory, metal, or sealing-wax. The Japanese supply them with handles. Those employed in Paris have handles that can be fastened to, or removed from the blunt end at pleasure; and this is a good mode of arrangement, as one handle will be thus sufficient for any number of needles. The handle is not only useful for the introduction of the needle, but also, when the thickness is not increased at the blunt end, for preventing it from sinking altogether into the soft parts,—a circumstance which has sometimes occurred, without, however, being productive of bad consequences. The needles employed in Europe have been made of steel, varying from one to four or five inches in length from the handle; those of the Japanese are invariably of fine gold or silver; and their manufacture is conducted only by a few persons, who obtain the emperor's privilege for the purpose. The operation itself constitutes a special occupation in the East: the points at which it is deemed proper, according to the nature of the disease, to plunge the needles, are marked by dots or lines on pasteboard puppets, called *Tsoe-bosi*, which are hung out as signs over the operators' shops. They serve as guides for the application, either of moxa or acupuncture; red dots indicating the proper place for the moxa, green ones for the punctures. The situation of these dots does not seem to have been arranged with reference to the large arterial or nervous trunks, as will appear from inspection of one of these dolls now in the museum of the faculty of medicine of Paris. One of the chief places of election is the middle of the space between the umbilic and the pit of the stomach. Most commonly, the operation is performed in this situation by pricking or puncturing nine punctures, ranged three by three in parallel lines, about half



an inch asunder. It is stated that they are so bold in the application of the needles, that they plunge them into the various viscera, and even into the fœtus in the womb, to repress its tumultuous movements; but they avoid carefully puncturing in the neighbourhood of the articulations. Moxa and acupuncture are held in high estimation by them, and, indeed, may be said to constitute the whole of their practice of surgery; acupuncture, in particular, is as universally employed, and in as great a variety of cases as bleeding, which they abhor, is with us. But they have the most unbounded faith in its efficacy, when indicated by pains which they suppose to depend on winds or vapours wandering about, or pent up in various parts of the body. The selection of the part, however, is not, except in cases where poor persons trust to their own experience, left to the guidance of the indications on the lay figure. The seat of the pain, if varying from them, sets aside their value, and whichever operation is to be performed, particular persons are consulted; these are called *Tensasi* touchers, or searchers of the parts, and *Faritatte*, the needle-prickers or operators.

The introduction of the needles is effected either by smartly pricking the skin, and pressing onwards, while the operator rotates the needle, or by a blow of a small mallet. Since the adoption of acupuncture by scientific practitioners, the following mode is preferred:—the spot being selected, usually the seat of pain, or when any circumstance forbids this, the adjacent parts, the operator having stretched the skin with the fore and middle fingers of the left hand, pierces it perpendicularly with a gentle pressure, and the body of the needle is advanced by means of a semi-rotatory motion, in opposite directions, till it has penetrated to the required depth; and this is repeated till the desired number is introduced. Their withdrawal is sometimes effected by means of a forceps; but it will be better to withdraw them by the same motion with which they were introduced, as the skin is painfully elevated by their direct and forcible retraction; possibly, also, by the latter mode, the point of the needle might be broken off, if it were not well tempered. The withdrawal of the needle is not followed by hæmorrhage, but sometimes a single drop of blood oozes from the puncture. In penetrating, the needle often meets with variable degrees of resistance, according to the nature of the parts through which it passes. The Japanese and Chinese allow the needles to remain only while the patient makes thirty respirations. M. Cloquet states, that he derived the most marked benefit in cases where he caused them to be kept in several days; this accords with my own experience. It is true, the pain may cease instantaneously on the introduction of the first needle; but we observe this by far more frequently after the needles have been in some time; indeed, so satisfied am I on this point, that I prefer a single needle remaining for some time in the part, to several introduced and withdrawn speedily. But there is yet no general rule as to the time which the needles ought to be allowed to remain. Dr. Bache, who has employed acupuncture successfully in America, in cases of rheumatism, states, the more chronic or long standing the disease, the greater will be the length of time the needles should remain in the tissues. Practitioners who are best acquainted with the mode of performing the operation, object to forcing the needle in by sudden and direct plunging,—the tissues on its route are thus wounded; whereas, they maintain, when the needle is gently rotated, that the fibres are only separated. In general, the pain of introduction is so slight as to be entirely disregarded; as a proof of this, it may be mentioned, when M. Cloquet drew the attention of the profession to acupuncture, in Paris, it was by no means uncommon to see the students bare the calves of their legs, and insert common pins into the substance of the muscles, to convince the incredulous of the innocuity of the operation. Sometimes, however, the progress of the needle is marked by sudden and severe pain. M. Cloquet describes the pain as bearing some analogy to an electric shock. M. Dantu has made the same observation[1]. After the needle has been a short time introduced, it produces a sensation of pricking, heat, and in some instances of cold and numbness; it is surrounded also by an areola, more or less vivid. Beclard saw one case in which the introduction of a needle into the leg to soothe acute pain, was followed by fainting and delirium. From the impression which it made on his mind, he felt disposed to reject the operation altogether. Fainting, however, must be of rare occurrence. M. Cloquet did not observe it oftener than once in thirty times in the thousands of cases in which it was employed at St. Louis. In upwards of fifty cases in which Dr. Bache employed the needles, he did not observe a disposition to swooning in more than one case; in which, however, syncope did not take place, and in no case was any untoward consequence observed. Care should be taken to have the needles perfectly polished before using them, as the pain of introducing one that is quite smooth will be comparatively slight; for this purpose, they should be passed into the emery bag both before and after use.

*Therapeutical applications.*—The boldness of some experimenters on acupuncture has been to the extent not only of exciting wonder but disapprobation on the ground of temerity. M. Samuel Cooper, in the article Acupuncture, in the Surgical Dictionary, observes, "In a modern French work (Berlioz's), it has been highly commended; but the author sets so rash an example, and is so wild in his expectations of what may be done by the thrust of a

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[1] When the needle is of an oxydable metal, a galvanic current issues from it, which is recognised by the galvanic multiplier of *Schweigger*. But this circumstance does not appear to have any influence on the efficacy of acupuncture, which is equally successful, when the needles are of gold, silver, or platina.

needle, that the tenour of his observations will not meet many approvers. For instance, in one case, he ventured to pierce the epigastric region so deeply, that *the coats of the stomach were supposed to have been perforated: this was done for the cure of an obstinate cough, and is alleged to have effected a cure!* But, if this be not enough to excite wonder, I am sure the author's suggestion, *to run a long needle into the right ventricle of the heart* in cases of asphyxia, must create that sensation." Yet, though I am far from recommending the practice, it is nevertheless certain, that most of the viscera of the great cavities have been occasionally penetrated in the human subject. without the least inconvenience. Cloquet, Velpeau, and Dantu, have shown that the arteries, nerves, and principal viscera, may be punctured with fine needles, without producing any serious effect.

Bretonneau has unhesitatingly introduced needles into the brachial and radial arteries in his own person, and into the brain, heart, lungs, and stomach of puppies, apparently without producing pain, or any perceptible injury or inconvenience. The innocuity of acupuncture may therefore be considered as established. But so much cannot be said for the certainty of its curative effects. The cases in which it has been most frequently observed to be successful are various painful affections, independent alike of active inflammation, or organic disease ; in muscular and neuralgic rheumatism, unaccompanied by heat ; in sciatica, lumbago, hemicrania, supra-orbital, temporal and facial neuralgies. It has been resorted to in muscular pains arising from strains and contusions, cramps, and uterine pains. M. Haime employed it successfully in a case of hiccup, which had long resisted the various usually indicated remedies. The general opinion of those who have observed its effects is, that it may be resorted to with prospect of benefit in diseases involving derangement of sensation and motion. M. Trouvé, of the Hospital of Caen, in a case of hysteria, accompanied with stiffness and drawing up of the inferior extremities, in a young woman, was successful in removing, in the space of three hours, the shortening of the limbs, and, at the same time, the severe pain in the loins, by means of four needles thrust into the lumbar region. Three days after, another attack of hysteria, which threatened, was averted by the introduction of six needles in the cervical region ; the same success was obtained in this case on several subsequent occasions, until the hysteria entirely disappeared. He relates another case in which relief was given in a case of paralysis of seven years' standing, which was produced by a fall on the back. (*Dict. de Méd.*)

Dr. M'Braire, of the London Hospital, has recorded in the *Medical Gazette*[1], a case of paralysis of the upper extremities caused by taking cold while the patient was under salivation, which was relieved by the use of the needles. Dr. Carraro has made some ingenious and successful experiments with the needles in the cases of asphyxia of kittens. The animals were plunged in water till all appearance of life became extinct ; the action of the heart was restored, and life renewed by passing needles through it.

The success attending the application of the needles has, however, been most remarkable in rheumatism. Of a hundred and twenty-nine cases treated by Cloquet, about eighty-five were cured. Of thirty-four published by others, twenty-eight were cured. Of forty-two cases taken in succession as they stood in the hospital books, thirty were found to have been cured, and the remaining twelve were not proper cases for the success of the remedy, there being much heat of the affected parts. Dr. Bache has had a number of similar cases, of which the great majority were cured by acupuncture ; but he observed, that it is much less successful in neuralgia. It is not uncommon to observe the pain of rheumatism or neuralgia shifting its seat on the application of the needles, and yielding entirely on their reapplication in the new situation the pains have shown themselves.

Amongst the means recently proposed to replace the use of ligatures for stopping hæmorrhage, puncturing the arteries with needles has been mentioned, though not with the same degree of confidence, or chance of success, as torsion. Bretonneau found in some instances that the transfixed vessel became blocked up with a coagulum, and finally impervious. M. Velpeau, his distinguished pupil, renewed and extended those observations in 1830, at the end of which year he read a paper on acupuncture as a means of obliterating the artery in cases of aneurism, before the Academy of Sciences. His object seems to have been to excite inflammation of the coats of the artery by the puncture ; while the needle being allowed to remain in the vessel, a mechanical obstacle would be presented to the blood, upon which it might readily coagulate. In the experiments made by Velpeau on animals, in all cases in which the needle remained three days, the transfixed artery, he says, was found obliterated. But the depôt of fibrin, by which the artery is rendered impervious, is by no means a certain result of the puncture, even though the pins be allowed to remain four days in the vessel. But, supposing it to occur constantly, it would still be a question whether it was superior to the ligature, as in either case, the vessel must be denuded. If the artery could be transfixed with certainty, without disturbing the parts in which it is embedded, it might be entitled to higher consideration, as we should thus avoid the danger of making large wounds of the soft parts, in which subsequent inflammation often destroys the expected effect of the best-executed operation. M. Velpeau has not thought proper to make application of acupuncture for the cure of aneurism in his own hospital, a fact which it may not be unfair to take as evidence of his own opinion of its value.

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[1] 1831. Vol. vii. p. 607.

Acupuncture has been very recently employed with success in the cure of hydrocele. In this process, the needle is used instead of the trocar, and the *palliative* is converted into the *radical* cure. This new application of acupuncture originated with Mr. Lewis, and is described by Mr. T. King, in the first number of the *British Annals of Medicine*, January, 1837[1]. A needle is passed through the skin, dartos, and cremaster, into the distended tunica vaginalis; as soon as it is withdrawn, a drop of the fluid exudes, and shows itself, like a tear, on the integuments. "The appearance of a drop of the fluid," says Mr. King, "at the top of the little wound, is the test of the operation being well performed; it shows that the bag is perforated, and that its contents can find their way out."

The needle, on being withdrawn should be rotated, as the success of the process depends upon the means afforded by the puncture, for the fluid being extravasated into the surrounding cellular tissue. In the space of twenty-four or forty-eight hours, the whole of the fluid is thus transferred from the cavity of the tunica vaginalis into the cellular tissue, the extent of the infiltration of the scrotum being in proportion to the quantity contained in the natural sac. The fluid is absorbed in the course of four or five days, and a permanent cure is thus effected. Upon the complete evacuation of the fluid, the tunica vaginalis is restored to its normal condition, and this is one of its advantages over the other modes of curing hydrocele, by inducing adhesion between the opposite surfaces of this serous cavity. Mr. Lewis has found this mode of treatment successful in every case of hydrocele in which he employed it. Acupuncture, merely as a palliative cure for hydrocele, would doubtless be a very great improvement; but how much more valuable does it not become, when we find it a safe, easy, and almost painless mode of remedying this troublesome affection? Some doubt may perhaps be entertained of its being sufficient to prevent the reaccumulation of the fluid in cases where the distension of the tunica vaginalis has been very considerable. But even should the fluid be again secreted, its evacuation, by successive punctures, will soon render the serous cavity so small, that success will be as easily attained as in a case of recent formation.

Acupuncture is advantageously employed in evacuating the serum in anasarcous limbs, and for this purpose is much to be preferred to the lancet, the punctures of which, when the habit is greatly debilitated, are liable to become sloughy; it answers well also in œdema of the scrotum, penis, eyelids, &c.; it has been employed with the same view in congenital hydrocephalus; it is also used sometimes in exploring the nature of deep-seated tumours, collections of pus, &c.

Acupuncture, associated with electricity and galvanism, under the name of electro, or galvano-puncture, has also been employed by Berlioz and Sarlandière: it merely consists in establishing a communication between the needles and the conductor of an electrical machine. M. Leroy d'Etiolles has proposed galvano-puncture in strangulated hernia; he hopes to reduce the intestine by inducing sudden contraction of it in the hernial sac; his views are supported by the favourable results of some experiments on animals. M. Majendie has also employed galvano-puncture in cases of complete and incomplete amaurosis; successfully in some of the latter.

Various theories have been proposed to explain the action of the needles. The Japanese believe that all diseases depend upon hurtful winds or vapours pent up in the organs of the body, and that acupuncture procures relief by giving them vent. Amongst scientific investigators, some suppose its effects to depend on derivation, others on some special influence, resembling the action of electricity. The nervous fluid has also been resorted to, to clear up the difficulty. Haime and Cloquet imagine that nervous pains depend on an accumulation of the nervous fluid in particular parts, and that the presence of the needles gives relief by equalizing its distribution. Dr. Bache adopts this opinion, and conjectures that the accumulation of the nervous (electrical?) fluid is favoured by an altered state of the fasciæ, whereby they are rendered capable of isolating the parts which they surround. No proof, however, is adduced that such is the fact.

It is not difficult to explain the indifference that has been shown to the extensive adoption of acupuncture; there is, in general, some disinclination manifested for the employment of a remedial agent, of which the action, or *modus operandi*, cannot be in some way connected, analogically, or otherwise, with that of the remedies which common use and universal experience have sanctioned. The effects of acupuncture are not deducible from counter-stimulation, for they are sometimes most remarkable when such stimulation has been scarcely felt,—nor from electrical agency, for they are equally produced when the needles employed are of gold or silver,—nor from moral agency, for they who deride the curative influence of the needles are as much benefited by their application, provided their cases be suitable, as those who have the most unlimited confidence in their efficacy; the reasoning and incredulous European, being in this respect on a level with the all-believing and unlettered Chinese. And yet these effects are not only beyond all dispute, but in many instances are so prompt, so marked by cessation of pain, as to impress the vulgar mind with the idea of supernatural agency. The differences of opinion respecting the value of acupuncture are the very opposites of each other, and are entertained by two classes of practitioners: the one indifferent, deeming its importance so problematical, so improbable, that investigation of its merits would be a waste of time; the other, enthusiastic, being satisfied from observation and experience, that many owe their deliverance from pain to the prolonged or frequent application of the needles, who had sought relief in vain from the adoption, and long perseverance in the use of other means. For our own parts, fully convinced of its importance in therapeutics, we should merely recommend that greater attention be bestowed in observing the cases in which it is found beneficial, in order to enable us to point out with greater precision, those in which it is suitable.

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[1] Mr. Travers has been in the habit of treating hydrocele for the last two or three years, both in hospital and private practice, by a nearly similar process. He does not, however, state the result as invariably successful. (See HYDROCELE.)—ED.

(*John Elliotson.*)

ADHESION, *adhæsio*, Lat., *πρόσφυσις* Gr., *adhésion, adhérence*, Fr., *Anwachsung, die Anhänglichkeit*, Ger., *conjungioni, aderenze*, Ital.

The term *adhesion* is applied in a general sense to the accidental, or abnormal union of parts, whether in consequence of a primitive arrangement of the organization itself, or of inflammation, producing the continuity of parts that are naturally unconnected, or artificially separated: in a more limited sense, that in which it is emphatically surgical, it designates the act or condition of union, between the sides of any preternatural solution of continuity. The French pathologists sometimes employ the word *adhésion* to denote the act, and *adhérence* the state of union. We shall notice in this article the adhesions, essentially reparative, that nature establishes between the different portions of membranes naturally free, that line the visceral, mucous, or synovial cavities, as well as those accidental adhesions which impede the functions of organs.

In a living organism, whose relations with the external world are innumerable, the power of sustainment alone, if it could be conceived, independent of that of reparation, would be obviously insufficient; and the first lesion of its integrity would involve necessarily the destruction of the whole. The designs of Nature would be frustrated; as few, if any, of the multitudes of living beings that exist, could ever reach maturity. Accordingly, in the study of organization we find that this reparative power, with its appropriate element, cellular tissue, is largely bestowed. The history of cellular tissue alone comprises, not only that of the production of adhesions in general, but of every other tissue of the body. It is not improbable, that the closest relation exists, from the most rudimentary state of the being to the latest period of existence, between the quantity of the cellular element and the intensity of the productive power.

In the first stages of human fœtal life, when the formative power displays such rapid and wonderful changes in the development of form and structure, the cellular or coagulable element may be said to be the only one that can be recognised, the matrix in which all the organs are successively moulded. In the adult, the power of producing organs has ceased as to the individual, being entirely diverted to a single function, that of the reproduction of the species; the cellular element has diminished in proportion to the organs that have been founded and produced in it, and its function now is simply reparative. In old age, the hard structures tend to predominate, the cellular tissue gradually diminishes, till the reparative power is totally extinguished, and death takes place.

This fact of reparation must have been amongst the earliest recognised by physiologists, and of course the mode in which it is effected must have been an object of investigation at a very remote period. Galen in some part of his works, in speaking of wounds, has bequeathed the very phrase which at this day is used to designate one of their modes of union, namely, *that by first intention.* The subject, however, had received but little useful investigation until the great Hunter turned his attention to it. He devoted thirty years of his life to the study of inflammation in its symptoms and effects upon the various tissues, and by thus tracing out a clear path in which the pathologist enjoys the advantage of his mighty labours, he founded a new era in the science, no less glorious for his country, and advantageous for humanity, than the discoveries of Harvey and Jenner.

Adhesion takes place between various parts of the fœtus in the womb; it is then termed congenital, and presents to us the imperforate conditions of the anus, vagina, eyelids, nose, mouth, &c. It occurs between the surfaces of parts, naturally free, when the conditions that produce it are present, and the parts are in contact, as between the costal and pulmonic pleuræ, the visceral and parietal folds of the peritoneum, the heart, and pericardium, &c., and between the surfaces of recent wounds when brought into contact, or so nearly so that the small space may be filled by a coagulable matter that soon exudes from the wounded surfaces. In this last sense, adhesion is eminently sanatory, and furnishes a broad basis whereon to rear up the noblest enterprises of surgery, constituting a large portion of its highest achievements, whether curative or operative.

Although the study of adhesion, inasmuch as it relates to surgery, may be chiefly confined to lesions produced by accident or art, on external parts, it will, nevertheless, be proper, in order to a clear understanding of all its phenomena, to consider adhesion, in whatever situation, and in whatever manner, it may be produced.

We shall first consider adhesion in its simplest form; namely, as occurring between the clean surfaces of an incised wound, in which, as Hunter expresses it, "the operations of restoration arise naturally out of the wound itself, which having been made in healthy parts, both the disposition and the means of cure are present." After the blood ceases to flow, a small portion may be retained upon the divided surfaces, which coagulates; when the lips in this state are brought together, a reddish lymph soon begins to exude, and an action is set up, during which the lips of the solutions of continuity become agglutinated. This lymph, to which Hunter gave the name of *coagulating*, is, according to the recent researches of Lassaigne, not albuminous, as has been hitherto imagined, but composed of the fibrine of the blood, in which new vessels are soon developed, by which the circulation and continuity of the divided parts are restored. As to this point, therefore, these researches are so far important as to remove a difference of opinion which prevailed between Hunter and Thomson. Hunter believed, that the bond of union might be produced in three ways:—1. by exudation of blood, when the quantity was not too great; 2. by the extravasation of coagulable lymph; and 3. by granulations. Thomson and others doubted the correctness of Hunter's opinion, as to the blood becoming the bond of union; but now that we know that coagulable lymph is fibrine, the colouring-matter of the blood being removed by a vital process, the body of the controversy disappears, and we at once recognise the unity of Nature's design, whatever be the means she resorts to, to accomplish it; namely, the production of plastic fibrine or lymph, into which, by uninterrupted elaboration, the vital elements, nerves, and blood-vessels, are ultimately interwoven. Hunter himself had all but furnished this explanation, in speaking of blood effused in wounds. "In many cases," says he, "in which we mean to produce union by first intention, it is not necessary to be very nice in spunging out the blood with a view to make the two surfaces of the flesh come entirely into contact, the blood itself answering a similar purpose. In several cases, having brought the two portions of loose skin together, I have seen the two cut edges unite almost immediately; and though the cavity underneath was distended with blood, yet it did well, the tumour gradually decreasing as the blood was absorbed; this is to be considered in the same light as an ecchymosis." When we read this passage, we cannot help wondering how a difference of opinion could have arisen on this point; and our surprise will be still greater when we read another passage, which occurs in the next page. "The mouths of vessels are soon shut, either by inosculation, or their own power of contraction, and by the blood becoming vascular, as in the former stated case of union by first intention; and if there be any superfluous extravasated blood, we know that it will be afterwards absorbed."

"The blood being alive, this uniting medium becomes immediately a part of ourselves, and the parts not being offended by it, no irritation is produced. The red particles are absorbed, and nothing but the coagulating lymph is retained, which being the true living bond of union, afterwards becomes vascular, nervous," &c. Here we see Hunter himself laying the foundation of the doctrine as to the unity of the end which Nature has in view, and even the unity of the means, although in the modes she resorts to to arrive at it, one may be more circuitous, more subject to interruption than the other. Possibly, the difference of opinion might have arisen from the circumstance that effused blood, particularly when the quantity is considerable, gives rise to great distension and irritation, or, when extravasated into a large uninflamed cavity, suppurates; but it should have been remembered, that, under such circumstances, the blood may lose its vitality, and thus become a foreign body; as long as extravasated blood is still alive, it retains the power of being vascularized anew, and of living in its new situation.

Another proposition of Hunter's, affirming that inflammation was necessary to produce adhesive lymph, has given rise to a controversy in which physiologists are still at issue. This point of doctrine, which, during a period of forty years, obtained universal assent, and which had been considered as established on an unshakable basis, has attracted the attention of modern pathologists, sharing thus in the scrutiny and experiment to which, in our own times, almost every important doctrine of medical science has been subjected. Perhaps it will prove, that the idea of inflammation, in too absolute a sense, has been attached to the term *adhesive inflammation*, and that Hunter had himself, in various passages, qualified the term in such a manner, as nearly to meet all the objections of the moderns. It should be recollected, how much more accordant it was with the great sagacity of Hunter, to study the phases and phenomena of inflammation in the various tissues, to mark and delineate them with the hand of a master, than to be critically exact in the terms he created to designate them. No one better than he had observed the circumstances which seemed to negative the existence of inflammation as necessary to the production of adhesion, circumstances which mark a mode of vitality which is now characterized as *irritation*, or *exaltation of organic action*. But he did not on that account perceive that there was anything forced in his grand generalization, when he included in it this state or mode of vitality, under the term *adhesive inflammation*.

When a wound is inflicted, lymph is effused, in the opinion of John Bell, from the divided surfaces, without any peculiar elaboration; the red blood ceases to flow, but a colourless fluid exudes from the divided vessels and from the *halitus* of the cellular tissue, which fills up the void, and equalizes the surfaces of the wound. John Bell thinks that the term *adhesive inflammation* is inapplicable to this process, which he regards as purely physiological. (*Discourses on Wounds*, p. 23.) The fact, that wounds adhere without the manifestation of inflammatory symptoms, strictly so called, was observed by Galen:—"Frequenter enim vidimus cùm integrum crus, brachiumve abscissum esset, coaluisse tamen vulnus, antequam inflammatio aboriretur." (*Adversus Erasistrateos*, Caput VII. Galenus.) M. Maunoir of Geneva, and Delpech, consider the adhesion that thus takes place, as a proof that the plastic lymph is not a product of any unusual action in the part, but the mere result of the coagulation and gradual hardening of the extravasated fluids. (*Mémoires sur les Amputations.*) M. Serre adopts the same view, and regards the phenomenon as appertaining to the same order, with that by which the ovum becomes united to the uterus. The opinion of the Physiological School of Pathologists is thus expounded by Roche and Sanson, (*Nouveaux Elémens de Physiologie*, ii. p. 504.) "Like the flow of blood, this exudation of the white fluids is owing to the division of the vessels of the tissues, and of the tissues themselves; when the opposing surfaces are placed in contact, this lymph is necessarily spread in a layer between the lips of the wound. Driven out from its natural conduits, and placed beyond the domain of vitality, it speedily coagulates. But the part is presently attacked by *irritation*, or rather already painful and irritated by the effect of the accident, its irritation increases rapidly, its vitality is augmented, and the layer of coagulated lymph promptly assumes the character of a membrane.

But we may ask, did Hunter deny that parts might adhere without any sign of inflammatory action being manifested during the process? Quite the contrary. In his division of inflammation into adhesive and suppurative, he seems less anxious about entering into a disquisition as to the constant presence of inflammation for the production of adhesion, than to mark the phases of the vital act that produces it. The idea which he connects with this act is that of increased activity of the nervous and capillary systems, with augmentation of the plasticity, which he is a witness will often arise without pain, redness, heat, or swelling. The sense which he attaches to the term *adhesive inflammation* is that of an action by which the vessels become capable of secreting the plastic element, and in this Thomson, Cruveilhier, and almost all the pathologists of this country, coincide. Thomson thus expresses himself in his admirable work on inflammation: "If the effusion of coagulated lymph ever does take place from the vessels actually divided, it would seem to depend on a change in the action of these vessels, by which they are in some measure converted from circulating into secreting organs." In speaking of the source of the coagulating lymph, Hunter says it is not easy to determine whether it comes from the cut vessels or the open cells; and in several passages in the same chapter he alludes to the painlessness of the action itself by which the lymph is produced. Thus, at page 319[1], he says, "It does not seem necessary that both surfaces which are to be united, should be in a state of inflammation for the purpose of effecting a union; it appears only necessary that one should be in such a state, which is to furnish the materials, viz., to throw out the coagulating lymph, and the opposite uninflamed surface accepts simply of the union; for I just observed, that extravasated blood produces a union without inflammation, and we often find adhesions of parts which can hardly be called inflamed."

One of the commonest alterations in the whole range of pathology is presented to us in those adhesions which occur between two portions of the pleural surfaces, and yet their production is effected in numerous instances without any perceptible symptom indicative of their formation. When it is remembered that there are some shades of inflammation, the phenomena of which are so slow and so obscure as to excite no suspicion of their existence, it will scarcely be denied that those adhesions in the internal membranes are produced without perceptible vascular excitement. We have just seen that this imperceptibility of the signs of inflammation is quite in accordance with the doctrine of Hunter; the excitation in the case of a wound may be equally imperceptible, though really present, the traumatic lesion producing no other effect upon the divided parts than that of placing them in the same condition as to the exudation of lymph that the vascular excitement had placed the internal membranes, and thus the cellular tissue may at once enter upon the reparative process, without manifesting the excitement.

As regards the opinion of M. Serre, we will not deny the analogy that exists between the process of adhesive inflammation, and that by which the ovum and the uterus become connected; nor is it necessary, in support of Hunter's views, that we should. Before we consented to debate the point, we should require of those who have taken up an idea on this subject, which they conceive to differ from that of Hunter, first, to prove that the process by which the parts of the fœtus become united differs from that by which it is effected in the state of extra-uterine existence. That which is inflammation in the fully-developed tissues of an independent organism may possibly present very different appearances in the fœtus, although the mode or act itself by which it is effected may be essentially the same in both cases. As we have already observed, the elements of the fœtus consist almost solely of the plastic kind, and are naturally in that state of active excitement which we conceive to follow the infliction of a wound. We may here repeat an observation which, amongst physiologists, obtains the currency of an axiom, viz., that which would constitute fever in the adult is normal action in the infant or the fœtus.

The act whereby adhesion is effected, whether by the adhesive or suppurative process, must be, both in its essence and elements, the same. In the first instance, coagulable lymph thrown out from the broken surface becomes the bond of union; in the second, the same lymph is thrown out by the granulations, and effects the same end. Nature has only been interrupted by the suppurative act, arising from the more active inflammatory process. Lymph is a living secretion, elaborated in a perfect state of preparation to form adhesions, so long as the excitement or inflammatory action, in virtue of which it is produced, remains confined to purely reparative limits; when the inflammation runs higher, the secretion is not reparatory, but morbid, and pus is formed. The secretion of lymph, whether from the cells, the ends of divided vessels, or the result of organic exaltation in the internal surfaces,—whether adhesions be morbid or reparative, the result is uniform; it becomes of the same nature as cellular tissue, from which, after a lapse of time, it can no longer be distinguished: it is, in fact, cellular tissue. This, to use the expression of Cruveilhier, is the organizing, as well as the disorganizing, element. No reparative process can take place in the muscular, tendinous, osseous, or nervous fibres of themselves; and if they were not abundantly supplied with cellular tissue, both within and around them, their lesions would be irreparable. Muscle contracts, nerve feels, and glands secrete; but to these purposes their functions are absolutely limited: their diseases are confined to their cellular tissue, and through it alone they receive the principles of nutrition or decay; and this is so strictly the property of the cellular element, and so active is this power where it abounds, that we often find, in treating surgical diseases, where it is desirable to prevent adhesion, how very difficult it is to control this tendency. Every surgeon knows what care and attention are necessary when it becomes an object to maintain a fistulous opening as a substitute for an obliterated natural one; as, for instance, the urethra obliterated by strictures and extensive extravasations, Steno's duct, the nasal duct, &c.

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[1] A Treatise on the Blood, Inflammation, and Gunshot wounds. Sherwood, Gilbert, and Piper; London.

Let us now trace the changes which take place in the effused fluid until it becomes fully organized. It is certainly a most remarkable property in blood, that the moment it comes in contact with an inflamed tissue it coagulates; this is one of the earliest effects of inflammation in an artery or vein: the inflammation of cellular tissue produces the same effect on the effused lymph, a fact which did not escape the observation of John Hunter, and which, by the way, might not have been destitute of weight with him when he connected adhesion with a *particular stage* of inflammation. After it has been effused twenty-four hours the coagulated lymph is white, areolar, and membraniform; in forty-eight hours, often earlier, it is vascularized, and furnishes blood from numerous points if any attempt be made to break it up; in three days its organization, though not perfect, is still more advanced; and in eight or ten, it is so solid that it resists any attempt at laceration as powerfully as the surrounding parts; finally, it is fibrous and cellular.

We have been hitherto contemplating the subject of adhesion, as between the two surfaces of an external wound. Let us now suppose a lesion in which the surface of the body covering the wounded parts remains entire, and there is consequently no access afforded to the external air, and no opening through which the injured parts can be relieved of the presence of the extravasated blood.

The question has been much agitated amongst pathologists, as to the mode by which the effused fluid establishes the continuity of the separated parts—Do the two ends of a divided vessel in a clean wound inosculate directly, when brought into contact or close proximity? Or do new vessels arise in the concrete mass of lymph, and by extending branches towards the surrounding parts, establish a new order of anastomoses?

In reference to the first question, Hunter observes, in a note, "I never could get an opportunity of observing it, in all my experiments and observations on inflammation, except in the coats of the eye. In many inflammations of that organ, we find an artery, or arteries, passing from the tunica conjunctiva to the cornea, and ramifying on that part. These have been cut across to prevent the influx of blood; the two ends are seen to shrink, but, in a little time, they are again perceived to unite, and the circulation is carried on as before. In this there can be no deception."

There is another experiment by Duhamel, which bears upon the same point. He broke the legs of six chickens: after the bones had united, he cut across about a third of the soft parts covering the callus; as soon as the wound had cicatrized, he cut across another third down to the bone; and when the second division had cicatrized also, he cut the remaining third. When the whole was healed, the injection from the upper part of the thigh penetrated to the extremity of the claws. "I cannot," says Duhamel, "affirm, whether the large vessels injected were dilated capillaries, or the large vessel of the leg itself re-established, but this experiment proves irrefragably the inosculation of blood vessels." In this conclusion Duhamel however deceives himself; the experiment merely proves the possibility of re-establishing the circulation after all the large vessels surrounding the limb had been successively divided, but not the direct inosculation of the divided vessels themselves.

In regard to the second question, whether the new vessels are the product of spontaneous generation, the evidence seems more direct and conclusive. "In a vast number of instances," says Hunter, "I have observed that, in the substance of the extravasation, there were a great number of spots of red blood, so that it looked mottled. The same appearance was very observable on the surface of the separation, between the old substance and the new, a good deal like petechial spots. Was this blood extravasated along with the coagulating lymph? In this case I should rather have supposed it would have been more diffused. I have therefore suspected parts have the power of making vessels and red blood, independent of the circulation."

An ingenious explanation has been presented of the mode in which the new vessels are mechanically hollowed out, but which is not however offered to the exclusion of the vital influences which direct their formation. It is well known, from the experiments of Dr. Clanny and others, that the blood contains carbonic acid gas in considerable quantity. Brande estimates it at a cubic inch for every ounce of blood.

I saw Dr. Clanny procure it from the blood of a patient whom he had just ordered to be bled, by setting it under a receiver, which he exhausted. This gas is evolved from the blood while it is undergoing coagulation. If the coagulating mass be examined with a microscope, the gas is observed, by its bubbling, to escape in all directions, forming a net-work of capillaries, anastomosing with each other, and which remain visible when the coagulum is dried—the action resembling what takes place in the panary fermentation. It is obvious that the formation of these canals is owing to the escape of the gas, for when the blood is deprived of it by the air pump, before it begins to coagulate, they are not formed, and the mass remains soddened. It might be doubted whether the same phenomena would obtain in a clot shut up in the living tissues of the body; but the question has been set at rest by some experiments of Sir E. Home. In one of these experiments, a clot was formed by dividing a small branch of the mesenteric artery in a rabbit, which received the injection twenty-four hours after. He also succeeded in injecting a coagulum, just formed, from blood which he had abstracted from a vein. He describes the disposition of the newly formed vessels as branching out from the small ampullæ, or spots, (which first become elongated,) into a double arborescence, like that of the vena portæ. We shall see in another place that he makes the same remark in the case of the formation of granulations.

The process of vascularization has however been represented as taking place in a different manner by other physiologists. Gendrin thinks that the neighbouring vessels force blood into the coagulum, and thus the canals are prepared. Laennec states that the rudiments of blood-vessels are presented under the form of streaks of blood, which soon assume a cylindrical form, and ramify in the manner of blood-vessels. On the one hand, it is believed that the new vessels are fully formed before the blood is impelled into them from the surrounding capillaries; on the other, that they are developed by the action of the primitive vessels, blood being first driven through the coagulum, in the form of streaks, which streaks are hollowed into vessels by the continuance of the same action. The point on which both are agreed is, that the vessels themselves are continuous with the venous capillaries, and that they are susceptible of injection from the primitive vessels, whether arteries or veins.

When thus completely organized, it gradually undergoes changes, until it presents all the characters of cellular tissue, equally susceptible of deposit and alteration as the same element in any other part of the body. The complete similarity, however, has been denied; and it is maintained by some, that adipose matter is never deposited in the cells of the adventitious medium. In reply, it is only necessary to repeat, that the changes, by which the bond of union is rendered cellular, are exceedingly slow, and that the inflammation in which it originated has terminated, as it does so frequently, in induration, which even time will not always remove. Tuberculous, and other deposits, have been found in the new organic substance; and if fat has not, a point which is by no means certain, it would not prove against the general proposition expressed above. It is, however, believed by many, that fat may also be deposited when the new organization becomes perfectly cellular, which of course requires considerable time.

We have been hitherto considering the vascularization of lymph as a result of wounds. The living parts may also be the seat of the deposition of coagulating lymph, without the intervention of any external cause. Severe irritation arising, and continuing in a part for some time, the affected spot is isolated, by the establishment of adhesion in the surrounding parts; these being rendered impermeable by the deposition of a yellowish serum and coagulable lymph. This process is purely preservative, as the diffusion of the inflammation is thus completely checked. It is to the absence of this plastic barrier that the extensive ravages, that take place in phlegmonous erysipelas, are to be attributed. (See Abscess, Erysipelas.) When the inflammation does not proceed to suppuration, in other words, when resolution takes place, the deposited lymph is absorbed, and the cellular tissue is restored to its former condition, becoming permeable and areolar. When the inflammation has run high, however, the absorption is not altogether complete; the walls of the cells remain permanently adherent, in the same manner, and by the same bond, as that which unites the edges of a wound; the cells are thus effaced, and the parts are indurated. The effect of this change in the cellular tissue merits attention from the surgeon, as it often renders intricate and embarrassing the performance of certain operations, which, had no such change occurred, would have been easy and expeditious. Take, for instance, a tumour in the neck, which has involved the blood-vessels and nerves, and which has thickened the cellular tissue surrounding them; he can only succeed in removing it by slow and careful dissection, whereas, had the cellular tissue undergone no change, he could have rolled it out from its connexions with his fingers alone, as soon as he had divided the external integuments. We have been hitherto considering adhesion as a result of a certain degree of organic exaltation, so well named by Hunter, *adhesive inflammation*, and which, by uniting parts which otherwise must suppurate, serves as a barrier to suppurative inflammation.

We shall now offer a few observations on adhesion in surfaces that have suppurated, or, adhesion by granulation. This portion of the subject will be but briefly noticed here, as it will be described more fully under the head Cicatrix.

Granulations arise only in parts that have suppurated, and, wherever they occur, are seated or based on cellular tissue. Their name expresses their appearance tolerably well, being small, red, shining, and globular prominences, more or less elevated, and highly vascularized. As these corpuscules bring about the same event, namely, adhesion, are they of the same nature as the vessels or cells from which the coagulating lymph is secreted, which becomes the bond of union in wounds that adhere by first intention? Is their action in producing the means of union the same? Most probably. Hunter considered suppuration to result from inflammation, carried beyond adhesive limits; but suppuration ceases by restoring the parts within those limits, placing them in the same condition, in fact, as that in which the surfaces, or rather the granulations secrete the same plastic lymph. In order to produce suppuration artificially, it is only necessary to prevent adhesion. (See Reunion.) When there is no cause to perpetuate the production of pus, the granulations become covered with a layer of organizable lymph. It may be here remarked, that as blood coagulates upon inflamed surfaces, so does pus, according to the observations of Home, upon the surface of granulations. It would appear, therefore, that whatever adhesive power is found, either in pus or in blood, depends upon its vitality, for healthy pus is not dead matter in the midst of our tissues, but a living secretion. Home's observations on these granulations are exceedingly curious, and will be reproduced under the article Granulation.

When granulating surfaces are apposed, they become covered with a very thin pellicle, which prevents any further secretion of pus. As regards the production of the vessels by which the granulations are so richly supplied, the same difference of opinion prevails, some believing that they are formed spontaneously in the plastic lymph; others, that they are merely prolongations from the primitive vessels. Hunter believed that they might be produced in both ways. But, on this point, we might invoke Hunter's own authority against himself, in support of the opinion that these vessels are of secondary formation. Hunter observed, that the vessels of granulations took a direction from their base to the circumference in *parallel* lines; now the very same arrangement is observable in the vessels of false membranes, the spontaneous formation of which is not disputed. The same difference of opinion is here reproduced as to the inosculation of the new with the old vessels; and, although it is not possible to deny the communication of these vessels, still it is by no means an easy matter to prove the direct inosculation. We cannot determine whether the extremities of the old vessels merely throw out plastic lymph only, or whether the excitement, which no one doubts must exist in them, is still kept up to form, or to inosculate with, the new vessels; all we know, positively, is the fact that they do communicate, and are continuous with each other.

The preceding observations establish that organizable lymph is the sole medium of adhesion, that it is thrown out in consequence of a particular mode of excitement, to which Hunter gave the name of adhesive inflammation; and that this inflammation is necessary to modify the parts in order to produce its effusion.

*Adhesions in different situations:*—In a practical point of view adhesions may be arranged under two general heads, viz. morbid and reparative. Another division may also be made in which they are classed in reference to the structures or situations in which they occur. This division embraces adhesions, not only of the serous or mucous surfaces generally, as of the pleuræ, peritoneum, &c., but of the vessels, skin, mucous passages, &c. wherever they may be formed. We shall study them in the order of their frequency.

*Adhesions of serous membranes:*—The cellular tissue itself may be considered as constituted of a multitude of serous cells, but as we have spoken so much upon it, in developing the general principles of adhesion, we shall pass at once to the consideration of adhesions as they occur in the large serous cavities.

The first point we have to remark, as regards serous membranes, is the prodigality with which they furnish the lymph, which is afterwards converted into membraniform adhesions. The abundance with which the lymph is thrown out in the irritation of serous membranes, and the apparent absence of vascularity, had, doubtless, suggested the idea that the productions were inorganic; but this condition is merely temporary, and, besides the apparent absence of vessels, is no argument against the fact of their being organized. This readiness to throw out lymph is, in many instances, attended with effects that are eminently preservative. A collection of matter takes place under the pleura costalis; the contiguous pulmonic pleura adheres to it; the ulcerative process attacks the adhesion, and the pus is coughed up through the bronchi; or a fatal extravasation is threatened from some of the organs of the abdominal cavity, the adhesive matter is thrown out, the suffering organ becomes united to the nearest turn of intestine, and the matter, which was on the point of making irruption into the abdominal cavity, is safely carried out of the body, through the passage that has been provided for it by the intestinal canal. It becomes also, as in the case of an abscess in the cellular tissue, the means of circumscribing the effects of an injury. "If we make a wound," says Hunter, "in the cavity of the belly and do not allow it to heal by first intention, still we find that no inflammation will take place, or extend further, than the attachment of those parts to the cut edges, except what is owing to continued sympathy. If this was not the case, every part of the same cavity must inflame . . . . . . if this contact be destroyed the whole cavity must inflame, because every part is under the same predicament with regard to exposure. The same thing would take place in the common cellular membrane, if those cells were not (in a natural state) in contact. Inflammation, in case of wounds, would as readily extend over the surface of each cell as air does through the cavity of each cell when blown into. Now this simple and natural contact of parts keeps the inflammation from spreading beyond the cut edges of exposure, and the inflammation only takes place at this part to preserve this contact. . . The cause of the limitation of the inflammation is the simple contact; this contact renders the sides of the cavity perfect again, and sets bounds to the immediate cause." Hunter, Op. cit. pp. 310, 311.

There is therefore a remarkable tendency in serous membranes, as shown in numberless instances, to limit inflammation, or to circumscribe its effects. This, Hunter regards as a purely defensive effort of the constitution.

Upon the first occurrence of irritation in serous surfaces, the lymph, by which the contiguous parts are joined, exudes from them in the same manner as it exudes from the lips of a wound. Cruveilhier has observed that the lymph is firmest at the circumference of the exudation, being spongy and porous towards the centre; and hence he infers that the blood, pus, or membranous flakes, like the globules of pus, which we sometimes find in the midst of a coagulum, are not secreted in that situation, but percolated by capillarization through these porous membranes from the serous surfaces. It was long thought that these productions were not organic, but merely served the purpose of a medium through which the vessels were carried from one side of the inflamed membrane to the other; but this notion is now justly abandoned. The provisional state of the exudation, upon which this idea was founded, is now known to be transitory; it gives place to a fully organized state of this new substance, induced by means exactly similar to those which are observed in the developement of the placenta, a state in which it is supplied with vessels capable of being injected. The same observation as to the distribution and character of these vessels, which Home made respecting granulations, may be repeated here; a trunk sends off an arborescence of capillaries from both ends towards the circumference of the adventitious membrane, a miniature representation of the portal circulation; these vessels are exclusively venous. "I never," said Cruveilhier, "found arterial vessels in organized false membranes. They could serve no purpose, since their capillary venous system communicates with the generally capillary venous system, and, consequently, with the torrent of the circulation; and this fact is in accordance with experiments which have convinced me that the venous system is the immediate seat of secretion, inflammation, and nutrition."

These adhesions are produced in great variety, depending chiefly upon the degree of mobility of the parts in which they are developed. Sometimes the union is so close and intimate that there seems to be scarcely any interposed layer; at others, the bands are prolonged and broken into cells, or numerous slips. Several observations prove that they sometimes disappear in consequence of being ruptured in this process of elongation. It is by this process that the cure of artificial anus is effected; for if the parallelism of the two ends of the intestine, adhering to the abdominal wall, where the preternatural opening exists, were to continue, the re-establishment of the course of the fæcal matter through the lower portion of the intestine could not take place; it is by the elongation of the adhesion from every point of its attachment, that the curve of the intestine may be restored, and that the opening in the side of the intestine is gradually lessened till it closes completely. In one of Dupuytren's cases of artificial anus, through which the fæcal matter was discharged only for twelve days, an opportunity occurred for examining the parts, the woman dying seven months after. The portion of the intestine in which the accidental opening had existed, and which it was expected would have been found adherent to the cicatrix, was four inches from it. A long band of membrane, broad at both ends, and almost as small as a thread in the centre, connected the parietal cicatrix with the intestine; this band did not communicate with the cavity of the intestine. M. Ribes states that he had not been able to find the slightest trace of adhesion in his examinations of the bodies of soldiers, who had, at periods remote from the time of their death, received wounds in the abdomen; the traction which the point of adhesion must have been constantly exposed to, from the peristaltic motion of the intestines, will perhaps account for this circumstance. Having premised these observations on the adhesions of serous membranes in general, we shall now study them as they occur in each serous cavity in particular.

*Adhesions in the pleuræ:*—These are the most frequent of all, and are found in the bodies of half the adults that are opened. They are often produced without any symptom of pain. They result however almost certainly from inflammation of the pleura. When they are so extensive as to impede the full expansion of the lungs, the latter diminish in size, and the walls of the thorax fall in gradually in proportion to the diminution. When a lung shrinks under the pressure of fluid effused into the cavity of the pleura, if an adhesion already exists, the adhesion is elongated, and may thus stretch across the cavity. When suppurative action has occurred on a point of the serous membrane, the pus is isolated by the production of organized lymph, and may thus be eliminated through the bronchi, or through the intercostal spaces, a track being formed for it towards the surface. Collections of pus confined to a spot of serous membrane, and thus voided, are often met with in authors. It has been doubted in such cases whether the inflammation first arose in serous membrane; but whether so or not, it is well ascertained that such adhesions between contiguous portions of a serous membrane may arise when the inflammation takes place in the cellular tissue, external to the membrane. The possibility of the existence of adhesions should be borne in mind when it is necessary to have recourse to surgical means for the discharge of collections of fluid in the cavity of the thorax. It will not be always easy to determine the best point for the performance of the paracentesis; and it will therefore be best to proceed in all cases as if such adhesions really existed. (See Empyema.)

*Adhesions of the peritoneum.*—The extent of this membrane, and the number and importance of the organs with which it is connected, renders the study of its adhesions extremely interesting. (See Abdomen.) In some instances, where peritonitis has been general, it terminates (and such a termination may be regarded as favourable,) in the fusion into one mass of the omentum, intestines, &c. An inevitable result of this glueing together of the intestines, is the all but suppression of the peristaltic motion, or at least such a degree of it as would insure the due performance of the functions of these viscera. Life, it is true, may be continued under these unfavourable circumstances, but it is embittered by constant suffering. The embarrassment of function, through the loss of mobility, is aggravated too often by low enteritis, or irritation of the mucous membranes of the intestines, which wastes and often destroys the patient.

*Partial adhesions of the peritoneum.*—Adhesions of the peritoneum present innumerable varieties in form as well as in organization; they occur as filaments, bands, looking like ligaments, elevations, &c.; they are laminated, cellulous, fibrous, granular, or infiltrated, or studded with tuberculous deposits. The author of this article has, within a very few days, met with an instance of this kind. But even though not general or extensive these adhesions may be productive of considerable distress, according to the nature of the viscus, whose function they impede; even rings may be formed, in which fatal strangulation of a portion of intestine may occur. The mind of the reader will readily supply instances: the loose omentum may contract attachments from one point to another, into which a portion of a neighbouring intestine may be forced; the impregnated uterus may contract adhesions while high in the abdomen which may impede the progress of parturition, or prevent the return of the organ upon itself when the fœtus and placenta have been expelled, and thus expose the woman to the perils of hæmorrhage. The existence of adhesions that impede function is often revealed by a sense of weight, or traction, which is experienced at a particular part, or at a particular time, which is often that at which the impeded viscus is more especially engaged in performing its function, whatever it may be.

A partial peritonitis may arise during the formation of an abscess in the liver, inducing adhesion between it and the diaphragm, and the peritoneum lining the right hypochondrium; the effect as regards the adhesions being the same, whether the pus is formed in a cyst, or whether it is collected in the substance of the liver itself. These adhesions are purely preservative, as through them the matter may be safely conducted out of the system by an opening in the parietes of the abdomen, or by working its way upwards through the diaphragm and the lungs, until it finds an outlet in the bronchi. The same aptitude for adhesion brings the liver into union with the other organs that surround it, the stomach, the duodenum, the gall-bladder, &c.; and through these an outlet may also be obtained for the matter which is voided by vomiting, or by stool. The gall-bladder, too, may, in like manner, be joined by adhesion to the anterior wall of the abdomen; and this is a point of much surgical interest, as, through means of the adhesive bond, the gall-bladder becomes safely accessible. But we must observe that the signs indicative of this adhesion are not always such as to give the surgeon full assurance of their existence; and without such conviction he will not undertake an operation on the gall-bladder, which, if the adhesion does not exist, must be followed by fatal extravasation of its contents into the general abdominal cavity. Petit, in the Memoirs of the Academy of Surgery, has endeavoured to describe the signs which he considers indicative of their existence. He says, "If the patient lies on his left side, with his legs drawn up to his belly, and in this situation we strive to push the tumour from one side to the other, and we find it cannot be removed from the spot where it rises, it is a sign that it is adherent; whereas, on the contrary, it is a certain sign that it is not adherent if it follows the motion of the fingers, and can be moved from side to side: if there be œdema, or redness of the external part of the tumour, we may be certain that it is adherent." This œdema, or doughy condition of the cellular tissue, preceding the march of an abscess towards the surface, has been already noticed in that article. (See Abscess.) It is a part of the adhesive process as it is developed in the intermuscular or sub-cutaneous cellular tissue, and it exhibits the difference between the extravasation of concrescible lymph and thin serum. An abscess is bounded by its proper cyst, which is coagulated lymph; beyond this boundary is the thin serum, which infiltrates the cellular tissue in advance of the purulent cyst, giving it the œdematous appearance and doughy feel. But even should these signs be present it will be better for the surgeon to establish the opening by means of caustic; for if the adhesions should not be fully formed they will be promoted by the irritation of the caustic, as adhesions of the peritoneum are produced, by external as well by internal irritations. In these cases it will perhaps be useful to bear in mind the feeling of rubbing, which Dr. Bright has found, in cases of adhesions between the visceral and parietal portions of the peritoneum, and in watching the progress of a case to ascertain whether it presents itself. The gall-bladder may also adhere and communicate with the colon.

In the left hypochondrium the spleen, under the influence of irritation, may contract adhesions with vicinal organs; it is thus found united to the stomach, the diaphragm, &c., and collections of pus may find their way from it into the thorax, stomach, colon, the kidney, or through the parietes of the abdomen.

The stomach is not exempt from the liability to contract adhesions; and under certain circumstances they may prolong or preserve life. In cancerous affections the perforation of the stomach would often occur much earlier than it does, if it were not prevented by the adhesions which unite the walls of the stomach to those of the surrounding organs. The fistulous openings, by which the stomach is connected with the external abdominal wall, and through which physiologists have been enabled to conduct some very interesting experiments on digestion, are established by means of adhesion, uniting the wounded organ to the wall of the abdomen.

Adhesions occur also between different portions of the small intestines, and are sometimes the effect of disease originating in the internal or mucous surface of the intestine. When this disease has proceeded to ulceration the peritoneum covering the ulcerated intestine adheres to the intestine apposed to it, and an opening is thus made between the two portions, which renders the intermediate turns of intestine useless. In cases of stricture proceeding to obliteration of the alimentary canal, nature attempts to re-establish the continuity by setting up this wonderful process of conservation. It was found, on examining the body of Talma, the celebrated tragedian, who died of obliteration of a part of the intestinal canal, that this process was nearly completed. In such cases, however, the communication is not always established between the upper and lower portions of intestines; it sometimes takes place between the intestine and the bladder.

The uterus and its appendages, in the diseases to which they are liable, may be glued together, or the uterus alone, in the malpositions of that organ, to the neighbouring organs, the rectum, and bladder. In cancer of the womb the adhesions preceding the alterations of the organ may effectually protect the peritoneum from any effusion of the morbid fluids, until it is in great part destroyed; or these organic alterations may produce such a degree of pressure on the organs in the neighbourhood of the uterus, as to produce a suppression of their functions. A case of this kind came very recently under my own observation. I was called at the request of the board to consult with my friend Mr. Bainbridge on the case of a patient in St. Martin's workhouse, who had not made water for five days. On examining the body after death, the cause of the obstruction to the flow of urine was found to be a carcinomatous enlargement of the uterus and its appendages, producing by pressure a perfect occlusion of the ureters, which were very much distended with this fluid. The autopsy was performed by Professor Partridge, of King's College. The preparation is in the Museum. The same disposition to adhesion is observable in the ovaries and uterine tubes; and M. Renauldin remarks that they are frequently found in women who lead a life of prostitution.

The purulent cyst of an abscess of the mesentery may extend towards the small intestine at its edge, and make way into its cavity; in the case of tuberculous deposits in the adventitious membranes, already mentioned, this communication between the mesentery and the intestine had been established.

*Adhesions of the peritoneum in consequence of wounds.*—These adhesions take place with remarkable celerity. (See ABDOMEN, WOUNDS.)

Instances are exhibited in the establishment of an artificial anus from strangulated hernia, where the surgeon is compelled, for his patient's safety, to leave the intestine unreturned; the adhesions by which it is secured in the lips of the wound are established in a few hours. It is upon this beneficent disposition in the serous membrane to contract adhesion rapidly, that M. Jobert's treatment of wounds, dividing the entire intestine, is established. This surgeon turned the cut edges of the lower intestine into the hollow of the gut itself by a sort of intus-susception, and then introducing the upper portion the two serous surfaces were made to correspond. Many experiments have been made with a view to the union of wounds of the intestines, all more or less directly founded on this property in the peritoneum. On this interesting point of surgical practice the labours of Mr. Travers deserve honourable mention[1]. M. Cruveilhier mentions a case of invagination of a foot of the intestine, in which the adhesions between the serous surfaces were so strong that the invaginated portion could not be drawn out.

*Adhesions of the peritoneum in consequence of hernia.*—Adhesions and transformations of tissue occur in endless variety, and often very rapidly too, in the contents of a hernial sac, and between these and the sac itself; and it is on such adhesions, much more than on want of space in the abdomen for their reception, in protrusions of long standing, that their irreductibility depends. In such cases the impossibility of cure arises from the adhesions: in newly-formed protrusions, on the contrary, when the intestines are fairly returned, all our hopes of obliterating the sac depends upon our success in inducing the adhesion of its sides.

While the surgeon is mindful of this power in the serous membrane to produce new matter, he will proceed with caution in his incisions to relieve an incarcerated intestine or portion of omentum. The deposition of the coagulable lymph may be so thick between the sac and the protruded intestine, that, on arriving upon it, he may mistake it for the omentum; or he may suppose that he has not yet arrived at the sac, and may wound the intestine. The principal circumstances connected with these adhesions, together with the indications they suggest, will be considered in the article HERNIA, to which the reader is referred.

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[1] Travers, on Wounds of Intestines.

The adhesions of the pericardium are next in the order of frequency: their production is regulated by the same vital powers as in other membranes of the same class, but they are formed under the influence, and of course modified by the unceasing motion of the heart. They demand no particular notice in a surgical point of view. This last observation applies also to the adhesions of the arachnoid. They are not frequent.

*Adhesions of the tunica vaginalis.*—The production of adhesion in the sides of the tunica vaginalis, by inducing inflammation as a cure for hydrocele, is a good instance of the curative effects of adhesion. This excitement of the walls of the serous cavity may be induced in various ways,—by inflammation of the testicle itself, by blows, a blister, the shock of an emetic, &c., or after the evacuation of the serum accumulated in hydrocele, by the injection of irritating fluids, &c. The tunica vaginalis, originally a prolongation from the peritoneum prepared for the descent of the testicle, is only cut off from that cavity by the process of adhesion. The communication is in general obliterated as soon as the testicle descends; if it should persist after this period, some portion of intestine descends also, forming what is called a congenital hernia.

*Adhesions of synovial membranes.*—Injuries in the neighbourhood of joints, sprains, fractures, aneurisms, dislocations with much contusion, greatly tend to inflame the synovial membrane, and adhesions followed by an anchylosed joint sometimes take place. The long continued immobility which is required to restore a fractured limb has produced the same effects.

According to Sir B. Brodie[1], the usual consequences of inflammation in the synovial membranes are, 1st, A preternatural secretion of synovia; 2d, An effusion of coagulable lymph into the cavity; 3d, A thickening of the synovial membrane, with cellular bands adhering to its reflected folds. This eminent surgeon believes that it is only violent and continued inflammation which terminates in the effusion of coagulable lymph in joints.

In proportion to the inflammation it has undergone, the synovial membrane has been found covered by a false membrane, or a soft kind of cellular tissue. Consequent to a fracture in an articulation, Dupuytren has seen the synovial membrane red, and presenting long membranous filaments of adhesion extending across the cavity of the articulation. M. Cruveilhier found the cartilages, synovial membrane, and capsule of the hip joint transformed into a dense cellular tissue of a very red colour.

The articular synovial membrane is rarely the seat of adhesions. "True anchylosis of moveable joints," says Cruveilhier, "does not so readily happen as has been supposed. I know of but three species of this disease. 1st, The articular surfaces are not implicated, but the joint is held immovable by an osseous ring, or by the less regular deposition of osseous matter around the joint. 2nd, The articular surfaces are absorbed, and the anchylosis is maintained by an interposed fibrous lamella. 3rd, The cartilages are absorbed, and the adhesion is effected by bony matter which is formed through the cartilages in a similar manner as occurs in the final junction of the epiphysis of long bones."

Adhesion of the synovial sheaths, on the other hand, is not of unfrequent occurrence. Inflammation but rarely occupies this neighbourhood, without their surfaces participating in it, and becoming cellular. The vesicular synovial membranes of the tendons are said to decrease in number in old age. Cellular transformation of sheaths is produced by old standing ulcers situated near them. The intense inflammation of panaris often agglutinates the tendons of the fingers to their sheaths.

The curious retraction of the fingers is caused by an altered condition of the sheaths and flexor tendons, strong and dense adhesions having glued them together.

*Adhesions of serous cysts.*—The treatment of accidental cysts, upon the plan employed to obliterate the tunica vaginalis, has been successfully adopted in many instances, and is preferable, when circumstances permit, to simple evacuation by puncture, to excision, or to the seton. Cysts of small size, and in situations where they are of easy access, are perhaps best treated in this way. Experience has even shown that cysts of the ovaries and of the liver may be obliterated by irritating injections. When cysts are of small size, evacuation with a needle and pressure will be often sufficient to produce adhesion.

*Adhesions of the skin.*—These can never occur, until the inorganic layer covering the integument is removed. But when the epiderm is removed as by burns or abrasion, adhesion readily takes place between different portions of the skin, provided they be kept in contact. (See CICATRIX, BURNS.)

*Adhesions in blood-vessels.*—In irritation of arteries and veins the same disposition to contract adhesion is observable. The same may be said of the veins; but they are obliterated more slowly than the arteries, and there is a marked difference in the mode in which inflammation affects these two orders of vessels. When an artery inflames, the blood in it coagulates, and becomes organized; in a vein adhesion may take place, to be subsequently destroyed by suppuration. Whatever causes compression on a vessel, and arrests the course of the circulation through it, may produce its obliteration. It may also be the result of disease, as in dry gangrene, or of operations performed on the vessels, as in blood-letting, the application of a ligature, *refoulement* (see TORSION of Arteries), wounds, &c. The value of torsion as a means of arresting hæmorrhage is entirely established on the production of adhesion in the coats of the twisted vessel, which takes place much more rapidly than when a ligature is applied. How strange it is, that English surgeons, who have been so long in the habit of healing by first intention, for which the process of torsion is so admirably suited, should be slow to adopt it; while the French surgeons, whose conversion to the doctrine of healing by first intention has been so tardy, have shown a readiness to abandon the ligature! The obliteration of a vessel converts it into a fibrous cord. (See LIGATURE, ANEURISM, ARTERY, PHLEBITIS.)

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[1] On Joints.

Adhesions have also been observed in the thoracic duct. M. Nasse, of Bonn, found the thoracic duct obliterated, from the second lumbar vertebra to the left subclavian vein, and converted into a cord as thick as a goose quill, though the valves were still distinguishable. Sir Astley Cooper has seen three cases in which this canal was partially closed; and Andral has seen one. The obliteration of the lymphatic vessels has not, perhaps, on account of their exiguity, been observed; but that such a change does take place has been inferred from analogy, as well as from the fact that they do inflame. M. Breschet, however, denies that any authentic observation has been made to establish a single case of the obliteration of a lymphatic vessel.

*Adhesions of mucous surfaces.*—Mucous membranes resemble, in their organization, that of the skin, with which they are continuous at the various natural apertures of the body. The skin is provided with an inorganic layer for its protection, called the epiderm; the mucous membranes have also a similar protection, derived from their *epithelium*, which is an epiderm of extreme tenuity spread over the secreting surfaces. When examined with a microscope the mucous membrane is, moreover, found covered with a soft villous plush, which prevents *perfect* and *intimate* contact between different portions of the same membrane.

On the subject of adhesion of mucous membranes there has been a great deal of discussion, some denying its possibility altogether, others maintaining that it did take place under certain circumstances. On this point, however, it is obvious that it was rather a misunderstanding than any real difference of opinion that prevailed. Bichat, who is said to have believed in the impossibility of adhesion in mucous membranes, was too good a physiologist, and too accurate an observer, to have entertained, in an unqualified sense, any such opinion.

There is unquestionably a most striking contrast in the adhesive disposition, and susceptibility, in the two classes of membranes, and this for purposes so obvious, that we cannot refuse to acknowledge in this salutary arrangement a result of wisdom and foresight. Any considerable adhesion between mucous surfaces would, in many instances, be destructive of life, as in obliteration of any point of the alimentary canal: while the omission, or the insusceptibility to contract adhesions in serous membranes, would often expose the individual to the unbounded ravages of inflammation and extravasations, and bereave the practice of surgery of half its well-won laurels. The proneness on the one hand, and the insusceptibility to contract adhesions on the other, may be thus exemplified. A collection of pus in one of the great cavities is carefully conducted towards the surface, where it is consigned to nature, or to the surgeon for its complete evacuation; while an aneurism enlarges in an internal situation also, condensing and applying to itself all the cellular tissue it meets in its progress, till it is stopped by a mucous membrane, which refuses to adhere as the other structures had done; and the sac bursts, and fatal hæmorrhage follows.

Like the skin there is but one impediment to the adhesion of mucous membranes, and that is the epithelium; remove it, and the adhesion, if there be contact, is easily produced. One remarkable effect of chronic inflammation in mucous canals is a gradual narrowing, even to complete obliteration in some cases; this is observed in the trachea, where tracheotomy has furnished an aperture for breathing; in strictures of the intestinal and urethral canals, when the fæces or urine obtain other means of exit, without which life could not be prolonged.

In acute inflammations of the mucous membranes, for instance of the pharynx or larynx, (*angina pellicularis*, or *diphtherite* of M. Bretonneau,) membraniform flakes or layers are thrown out, frequently in great profusion; they are exactly of the same nature as the plastic exudations from other tissues. They do not adhere to, or rather they are detached from, the mucous membrane, in consequence of the mucous membrane itself remaining entire, and therefore in a state incapable of contracting adhesion with the false membrane.

Are the narrowings that take place in the mucous passages a result of adhesion? Probably not. The gradual diminution of these passages may be explained without the intervention of the adhesion of the mucous surfaces themselves, at least till a very advanced period of the progress of coarctation. The submucous cellular tissue may become the seat of deposits; it may be thickened or hypertrophied, so as to encroach upon those passages, and narrow them to such an extent as to embarrass them seriously, and even render impossible the fulfilment of their functions. The vagina is subject to this sort of narrowing from acute or chronic inflammation, and I have myself lately met a case in which the almost complete obliteration of this canal was coincident with, and perhaps a consequence of long standing engorgement and alteration of the structure of the uterus. Dr. Mackintosh of Edinburgh possesses a large collection of preparations of the uterine organs, in many of which these coarctations are very remarkable in regard to the *os uteri* itself. Meckel, Walthers, and Breschet have observed in women of advanced age, as also in prostitutes, the mucous surfaces entirely obliterated by adhesion.

The urinary mucous passages are also the seat of narrowing and adhesion. I have, in a calculous patient, observed two strictures in a dilated ureter which had given passage to several calculi. The body of the bladder itself, and its mucous membrane, narrows under the influence of long continued irritation. There is nothing more common than the narrowing of the urethra, either by the alterations of its submucous cellular tissue, or by membranous productions (*brides*) from its proper surface. The glans and prepuce adhere firmly. I lately saw a case in which I was obliged to dissect the prepuce from the glans; the adhesions were very firm, and a band had nearly shut up the orifice of the urethra. The patient had been on a remote station, serving as an officer in an African regiment, when he contracted the inflammation which terminated in these adhesions.

The other mucous canals of the genito-urinary system have been also found obliterated.

The gall-bladder and cystic duct, the pancreatic duct, lachrymal puncta, the Eustachian tube, Steno's duct, and those of the sublingual and submaxillary glands may be obliterated from acute, or chronic inflammation, long continued.

The removal of the inorganic epithelium, and the alteration of the natural secretion, must in all probability take place when the eyelids become adherent to each other and to the conjunctiva. In the cuticular excoriation, or *scalding*, as nurses term it, occurring in infants who are not properly attended to, the labia pudendi become adherent. High inflammation, with ulceration of the vagina, may be productive of the same result in this canal. Dupuytren states that his attention was requested to a woman who had suffered a rupture through the recto-vaginal partition in the course of a difficult parturition; and, upon examination sometime afterwards, he was astonished to find the vagina so much obliterated by adhesions, that copulation was entirely prevented. Cruveilhier mentions another case, in which complete adhesion of the entrance of the vagina was produced by the use of an injection of corrosive sublimate.

The tendency in mucous membranes to contract adhesions, we thus see, is extremely powerful. The frequency with which fistulous openings, and long sinuous tracks, are established, and the obstinacy they manifest against the means resorted to by the surgeon to procure their obliteration, is no argument to the contrary; their resistance to adhesive action is the same as that of the natural passages, and depends upon the same cause, namely, the integrity of the accidental mucous membrane.

*Curative indications of adhesion.*—Having considered adhesion in a general manner as a result of inflammation, we may now advert to it as a means of fulfilling some of the most important indications in surgery.

When John Hunter, in his experiments, transplanted the soft horny spur from a cock's leg to the comb, and produced adhesion between parts so naturally incongruous, he was only illustrating the vital powers, upon the action of which union by first intention depends. When he observed the exudation of lymph from the surfaces of the wound, and that this lymph, without which union is impossible, soon became penetrated by blood-vessels giving rise to that action which he called *adhesive inflammation*, he was but extending those principles, and developing, with the hand of a master, their great practical importance. In our times the importance of his labours is manifested in the numerous brilliant applications which modern surgery has made of this wonderful law of the animal economy, and which constitute exclusively all those operations for the supply of deficient parts, the restoration of mutilated features, and the correction of many deformities known under the general name of Autoplasty. Nature in wielding the power of adhesion is guided in general by the intent to prevent or limit mischief, or to eliminate, by a route which the normal condition of the organism had not provided, morbid products or secretions, the presence of which would cause destruction. Adhesion is thus often the only thing needed, the point which decides for life or death. The many important purposes it becomes subservient to in the hands of the surgeon entitles it to rank as a therapeutic agent of the first order; and, indeed, there is no page of British surgery to which we may refer with higher pride than that in which Hunter first developed the laws of adhesion, and none which has had a more direct influence upon the recent progress of the art.

When the cavity of an abscess is to be obliterated, the cure of a hydrocele to be effected, the circulation to be cut off from an aneurismal sac by a ligature, it is by adhesion that the surgeon accomplishes the desired object. When the cure of an aneurism is spontaneously effected, or the progress of gangrene arrested, it is to adhesion in the blood-vessels that the result is due. It is to adhesion, in fine, that we are indebted for the cure of artificial anus, the obliteration of fistules, and the restoration of the integrity of injured parts in whatever organ of the body the solution of continuity may occur.

A principle so important and vast as adhesion must find extensive applications in surgery, which the reader will find under various heads throughout this work, and for which he is referred more particularly to those of ABDOMEN, ABSCESS, BURNS, BONE, CICATRIX, CYST, HARE-LIP, HERNIA, HYDROCELE, REUNION, RHINOPLASTY, STAPHYLORAPHY, SUPPURATION, WOUNDS, &c. &c.

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ADHESIVE PLASTER; *emplastrum adhæsivum*, Lat.; ἔμπλαστρος, Gr.; *emplâtre agglutinatif*, Fr.; *Pflaster*, Ger.; a solid and tenacious compound, thinly spread on linen, paper, or leather, adhering to the skin at the ordinary temperature of the body. Plasters in general are composed of unctuous substances, united with wax, resins, powders, metallic oxides, &c., and are prepared by heat. Adhesive plaster is employed in surgery, to keep the edges of wounds, resulting from operations or injuries, in contact, until they become adherent; to make compression, with a view to accelerate cicatrization in old and indolent ulcers; to contain blisters, issues, sinapisms, dressings, &c.; to protect exposed surfaces from friction, stripping, &c.; to prevent the air from penetrating in wounds of the splanchnic cavities and articulations; and in the opening of certain abscesses, by successive puncture. (See ABSCESS.) The adhesive plasters in most common use are, the diachylon, the court plaster, and the plaster prepared by the dissolution of gum ammoniac in vinegar, spread on cloth. This last is often found useful, where the skin is moist, as it requires moisture to make it stick. The court plaster, which is made of a solution of isinglass, thinly spread on moderately fine muslin or silk, repeatedly rubbed with a little tincture of benzoin, requires also to be moistened a little when applied; but it soon dries, and curls up at the edges, and can only be employed on small surfaces.

When the adhesive plaster is made in large quantities a machine is used for the purpose; it consists of a table with two uprights, which are moveable, and furnished with points; between these a metallic plate is fixed, under which the cloth is drawn; the under edge of the plate spreads the melted plaster evenly, while the cloth is drawn in lengths.

Unbleached calico is best adapted for making good adhesive plaster, on account of its downy surface, affording firmer union with the glutinous substance. Calendered cloth is not adapted for the purpose, as the plaster cracks and drops off from the already glazed surface. The cloth should be very even in texture, neither too fine nor too coarse. The emplastic substance should be so compounded as to soften at a gentle heat; and with this view, regard should be had to the season in which it is to be used, whether winter or summer, and the ingredients modified accordingly.

For use, adhesive plaster is cut into bands or straps, of various lengths and breadths, in the length of the cloth. When used for closing flaps upon the stump, after amputation, some surgeons cut their straps not quite straight, but slantingly, so that the middle of the strap is somewhat narrower than either of the ends. This mode of cutting the slips has two advantages; the wider ends give firmer hold, while the narrow centre, corresponding to the line on which the flaps are united, covers the wound less, and allows spaces for the escape of sanguineous or sero-purulent fluid exuding from its lips, which, if retained, would give rise to pain, tension, inflammation, and the formation of an abscess.

The mode of applying the straps is very simple: the lips of the wound having been brought into contact, and adjusted, and so maintained, when necessary, by an assistant, the surgeon takes between the index finger and thumb of each hand, the ends of the adhesive strap, and after heating it a little before the fire, or by passing its outside surface, from end to end, over a moderately heated Italian iron, he applies one of the ends to the least moveable of the lips of the wound, and assists its agglutination by pressing it with his fingers; the assistant then holds it firmly to prevent its slipping off, while the surgeon, having both his hands now free, re-adjusts the lips of the wound, and applies the other end of the strap down the skin of the opposite flap. He then applies, in succession, as many slips as may be required. The manner of disposing of the straps varies according to the direction of the wound; when straight, they are applied perpendicularly to its direction; this rule should be adhered to in the application of every single strap, so that if the surgeon has to deal with a semicircular wound, the straps take the direction of radii from a common centre, crossing from the convex to the concave side of the wound. Some surgeons place the first strap over the middle of the wound, and in many cases it is the most convenient mode, but it is often a matter of indifference whether it be placed at the middle or the extremities; in large flaps, the middle strap should always be applied first; in such cases, the adhesive plaster will be often insufficient to hold the lips of the wound in contact, and a point of suture may be required for this purpose; or it may be necessary to support the adjacent parts by graduated compresses of various forms, skilfully applied and maintained. Ancient surgeons had an idea, that the adhesive plaster was applicable only for the reunion of wounds of the skin, and subjacent cellular tissue, and consequently employed sutures much more frequently than those of the present day; they called the union by adhesive bands, *the dry suture*, that by *stitches*, the bloody suture. (See SUTURE.) They also made use of a mode of bringing the lips of a wound together which may be regarded as uniting the principles of both; it was effected in the following manner:—two indented slips of adhesive plaster were pasted over the brinks of the wound, of a width sufficient to insure firm agglutination; the indented edges, corresponding with those of the wound, had threads sewed to them at short intervals; the edges being brought into contact, the threads were tied across the wound. They were also in the habit of fenestrating their emplastic applications, a practice which is still continued for light dressings over suppurating wounds, at the Hotel Dieu.

The parts over which the diachylon adhesive straps are to be placed should be shaved previously; if this precaution be neglected very annoying pain is felt, and sometimes separation of the agglutinated parts is produced, when it becomes necessary to renew or remove the slips; they should also be washed, and sponged quite dry, before the bands are applied; the latter precaution is unnecessary when the court plaster, or the gum ammoniac plaster, is employed.

The removal of the straps requires great gentleness; the surgeon should begin by detaching one end, until he has freed it, to within an inch or so of the edge of the solution of continuity; he then detaches the opposite end of the same slip, till he has approached the wound in the same manner, then, taking both ends together, he gently draws them off the face of the wound in a direction perpendicular to it. If it be completely cicatrized, the straps are all successively removed in this manner; but if the object be simply to remove them, in order to apply others, instead of those that have become soiled, or that have fallen out of their proper bearing, they should be removed and replaced one by one. The length of time they may be allowed to remain varies according to the firmness with which they adhere, the extent and condition of the wound, the lightness with which they lie, their inoffensiveness to the parts, &c.; they may remain on, in general, from one to eight days.

If the bands are placed unevenly, or in such a manner as to make folds of the skin, they may give rise to great pain, inflammation, suppuration, and even to the formation of a slough; it is not uncommon in delicate persons of fine skin, and in children, for the pressure of the adhesive straps to produce an eruption of small, painful, pustules; and when erysipelas prevails in hospitals, it often seizes on solutions of continuity, that are too tightly dressed. In the latter case, the straps should be slackened; and, in the former, cold lotions, light dressing, &c., will quickly dissipate the irritation. When their tightness gives rise to extensive inflammation, it may become necessary not only to relax them, but to remove them altogether, and apply a large emollient poultice.

The diachylon adhesive plaster is often observed to turn black in the part that covers the wound, which, in its turn, is blackened by it; this arises from the oxide of lead, one of the ingredients, combining with the sulphuretted hydrogen from the wound, and forming a black sulphuret of lead. (See ULCERS, COMPRESSION.)

(*Wm. B. Costello.*)

ADUSTION, *adustio*, Lat.; *adustion*, Fr.; the action of fire on the living tissues; synonymous with actual cautery. (See CAUTERIZATION.)

ÆDŒATOMY, *ædœatomia*, Lat.; (from αἰδοῖα, 'the pudendum,' and τέμνω, 'I cut,' Gr.) the excision of the labia pudendi, and of the clitoris, when hypertrophied.

ÆGYLOPS, or ANCHYLOPS, αἰγίλωψ, Gr. (from αἴξ, αἰγὸς, a goat, and ὤψ, the eye.) An ulcer in the internal angle of the eye, so named from its giving to the human eye some resemblance to that of a goat; this ulcer results from the bursting, externally, of a small abscess situated over the lachrymal sac. In some of the old writers it is described as the fistula lachrymalis, of which they regard it as the first stage or degree. But the ægylops may exist while the apparatus for the excretion of the tears still continues in a state of perfect integrity; it is not converted into the fistula lachrymalis until, by the progress of the ulceration, a communication is established through the posterior wall of the abscess with the lachrymal sac. The lachrymal sac is protected from the extension of the inflammation; and the simple ægylops is easily cured, by such treatment as will be proper to relieve the congested cellular tissue. But no time should be lost, as the bulk of the tumour, by arresting the flow of the tears through the proper channels, and producing epiphora, adds greatly to the irritation in which the affection originated. The surgeon should be careful not to confound ægylops with fistula lachrymalis, the treatment of the two affections being very different. In the first stage of the tumour, recourse must be had to local depletion, by leeches, the application of emollients, and the antiphlogistic regimen. Should the abscess form, it should be opened as soon as the smallest point of fluctuation can be discovered; should the surgeon not be consulted till the ulcer is established, he should ascertain that the lachrymal sac is still entire. When the case is so, the probe does not enter the sac; injections through the lachrymal *puncta* will not pass through the ægylops; besides the history of the case, the condition of the pus, &c., will help him in forming his diagnostic; the ulcer should then be dressed with dry lint, and gentle pressure should be made on the thin and detached edges; these, as well as the fungating granulations of its surface, should be touched with caustic, great care being taken to avoid injuring the lachrymal sac. By the methodical employment of these means, and attention to the general health, should it be necessary, the ulcer will be speedily cicatrized.

AGALACTATION, see Aglactation.

AGARIC, *agaricum*, Lat.; ἀγαρικὸν, Gr.; *Bläetterschwamm*, Ger.; *amadou*, Fr. Its name is derived from a region of Sarmatia. Agaric is a species of fungus, or champignon, growing on the oak, the linden-tree, &c, It is prepared by drying the fungus, beating it out with a heavy wooden mallet, cutting it into pieces, and beating it out again, until it becomes quite a soft and pliant felt: it is employed in surgery to arrest hæmorrhage from leech-bites, bleeding ulcers, and small vessels, from which the blood oozes after operations.

It was first introduced into use by Brossard, a surgeon of Chartres, about the middle of the last century, and was received with great enthusiasm as a substitute for the ligature, cautery, &c. It is needless to add, that no one, at the present day entertains any such opinion of the effects of the application of agaric. It is proved beyond a doubt, that it possesses no styptic or astringent property whatever, and that it only acts mechanically, or in the manner of a tampon, or plug. (See Hæmorrhage, Hæmostatics.) When applied to a bleeding surface, it rapidly absorbs the moisture of the wound, together with the serous parts of the blood; the blood is thus made to coagulate at the very mouths of the vessels which furnish it, while the coagulum itself derives solidity from the agaric, which becomes adherent to the surface on which it is applied. There are, however, some precautions necessary to insure this effect. The agaric should be perfectly dry, and the surface of the wound should be spunged dry, at the moment of its being applied; it should then be held firm, and with a degree of compression, to the bleeding surface: when this is neglected, the agaric becomes penetrated with the moisture, the bleeding goes on, and it is soon detached, with the clot itself. When the methodical application of the agaric fails, the bleeding vessels must be sought for and tied; or if the blood oozes from a large surface, recourse must be had to the application of ice, or to actual or potential cauterization.

AGGLUTINATION, (from *agglutinare*, Lat.; κόλλησις, Gr.;) the glueing together of parts that have been separated. It indicates the early stage of adhesion, during which plastic lymph is thrown out; the union in this state is mechanical, and may be dissolved by even a slight disturbance of the parts. But this lymph becomes organized, and the state of agglutination passes into one of firm adhesion, endowed with a power of resistance equal to that of the surrounding parts. (See Adhesion, Cicatrization, Adhesive Plaster.)

AGLACTATION, AGLAXIS, *agalactia*, Lat.; ἀγαλακτία, Gr. (from α, and γάλα, 'milk,') *Milchmangel*, Ger. Absence of milk after parturition, or its suppression by disease, or any cause independent of the will; and in this respect, it differs from ablactation, in the production of which, by the employment of certain means, the will concurs. The milk may be secreted and retained, as in *mastoitis*, vulgarly called the *weed*, but this is not the case we are now considering.

The secretion of milk does not take place after parturition; or, if begun, it ceases when any important organ is seriously attacked, and this the more certainly, if the organ should be closely connected, functionally, with the mammæ themselves: thus inflammation of the uterus and its appendages will be most likely to be accompanied by the suppression of the milk, although it takes place also, when the peritoneum, pleura, lungs, brain, cellular tissue, &c., are seriously involved, as in puerperal, or general fever. Nurses and attendants usually describe it, in popular language, by saying that the *milk has flown to the head, &c.*, an idea which, in the present state of pathology, it is scarcely necessary to observe is altogether erroneous. The secretion is simply suppressed; but the milk is not translated to the inflamed organs. The mammæ become flaccid, and there is, doubtless, resorption of some portion of the milk; but it is eliminated, as resorbed fluids are, and does not hurtfully, and in its integral condition, circulate with the blood, The suppression of the milk constitutes an unfavourable complication of the malady, as the suppression of the cutaneous perspiration, or of the urine may in other circumstances; in either case, however, it is the effect, and not the cause, of the malady.

Upon the subsidence of the general excitement, the secretion is restored spontaneously, particularly when the disease, during which it disappeared, has been of short duration. But when the disease has existed for some time, there is often no return of the secretion, after the disease has been completely subdued.

The suppression of the mammary secretion sometimes takes place without any appreciable cause; this is observed mostly in young and over-anxious mothers of spare habit, and in whom the mammary glands are but slightly developed, persons residing in close towns, and in ill-ventilated situations. It also occurs in consequence of mental emotions in the nurse. Some women cannot suckle their children in the presence of a stranger, being for the moment as powerless in this respect as many individuals are, as regards other excretions of the body, under similar circumstances. The milk ceases to be secreted when the most powerful stimulant to its secretion, namely, the suction of the child, is withheld, or upon the supervention of pregnancy. (See Lactation.)

When the quantity of the milk diminishes gradually until it disappears altogether, it is often very difficult to re-establish it: the food should be nourishing, generous, and of easy digestion. Acids should be avoided. Ricemilk, porter, and Embden groats in gruel, are recommended; the breasts should be kept warm, and it will perhaps be found useful to excite them by friction. But the best excitant of all is the suction by the mouth of the infant. When these means fail, there is no choice; the infant must be weaned and brought up *by hand*, as it is termed, or another nurse must be provided. When the breasts are ill-formed, or not prominent enough, they should be drawn with an appropriate instrument. But it may not be practicable either to suckle the child, or draw the nipples, in consequence of the sores or cracks accompanying a mastoitis, as in this case the attempts would be too painful for endurance; pressure gently made on the less painful parts of the breast, with gentle suction by a nurse, will be the only means admissible. (See Mastoitis.)

Hired nurses often conceal the suppression of their milk; this may be suspected when the infant becomes fretful, with dryness and heat of skin; the breasts should be examined; if they are found to be constantly flaccid and empty, and that no milk can be obtained by pressure, beyond a drop or two of thin, serous fluid, the milk is secreted in too scanty quantity to satisfy the infant, and will soon cease to be furnished altogether.

AGRIPPA, *(Obstet.) partus, agripparum, agrippinus*, Lat.; derived, say some authors, from *ægre partus*, others from ἄγρα, "seizure," and ποῦς, "foot." Birth by foot presentation. Pliny uses it in this sense. It is pretended that Agrippa owed his name to the circumstance of his having been thus born.

AIDE, *adjutor, minister*, Lat.; *assistant*, Eng. The surgeon, in the hospital, operating theatre, and on the field, requires one or more assistants to aid him in the discharge of his duties. The qualities requisite in an assistant are physical or moral. The possession of mere bodily strength to prevent the patient from making any sudden movements, by which the safety of the operation, and perhaps even life itself might be endangered, or to hold the part on which the surgeon is operating, is often sufficient for the necessities of the case. An uneducated man is quite as capable as any other of making counter-extension for the reduction of a luxation, or the adjustment of the ends of a fractured bone. Under other circumstances, however, the assistant cannot be too conversant with all the resources of the art of surgery, as the success of an operation often depends upon the manner in which the operator is assisted. How desirable it would be in many cases, that the surgeon should be seconded by a person, not only familiar with all the details of the operation, but capable of performing it!

The duties of the assistant are various; and where several are engaged in an operation each has his part assigned to him, some being stationed to hold and encourage the patient, others to hand the instruments in the order in which they are required,—to supply sponge, ligatures, or whatever else may be necessary. Such an arrangement is always made a preliminary to the regular operations of surgery. But how much more necessary must these previous dispositions be, when the operation to be performed is one of those irregular, unusual proceedings in which it is impossible for the surgeon to have an idea beforehand of all the difficulties he may have to encounter!

Persons accustomed to hospital practice are best qualified for the duties of assistants, possessing, as they do, the necessary strength and address to make compression on the trunks of arteries, to seize bleeding vessels, put on ligatures, fix the organ in operations on the eye, &c. Their conduct should be regulated with great prudence and discretion, so that, during the operation, no word or gesture escape them to alarm the patient by the idea of unforeseen danger or difficulty; they should be firm enough to bear the sight of blood and the cries of the sufferer. The qualities of an assistant are best appreciated by the surgeons most engaged in the performance of the operations of what the continental surgeons call "high surgery;" they are too often overlooked by persons less conversant with the fulfilment of those arduous duties.

The number of assistants must be regulated by the nature of the operation to be performed; it is proper, in all cases, to limit it to those that are indispensable, more particularly in cases of females, when the operations interest parts, the exposure of which to a crowd of persons, would excite in the patient feelings of shame and humiliation.

(*Wm. B. Costello.*)

ALBUGO, *albus*, Lat.; ἄργεμα, Gr.; a pearl or web, Eng. This word is employed to designate a white opaque spot or stain upon a part or the whole of the cornea, which, in proportion to its extent, destroys its transparency. There are several varieties of these opacities, which will be noticed under the articles Nebula and Leucoma, which differ, however, from the albugo. This affection, which was described by the ancients, Pliny in particular, is most commonly a consequence of violent inflammation of the eye, terminating in the effusion and organization of lymph between the laminæ of the cornea. It is also sometimes observed to be formed slowly, and without being preceded by inflammation, in persons of scrofulous habit, or who are tainted with the syphilitic virus.

The albugo presents the appearance of an irregular spot, the opacity of which sometimes reflects a blueish or pearly colour: the centre is commonly the densest part; but even at its borders, where it is thinner, the contrast it presents with the translucent cornea is sufficiently striking. The colour of the recently-formed albugo is blueish; that of the albugo of long standing, a dead white. Sometimes small blood-vessels can be seen entering its substances; at others, it seems isolated in the midst of the cornea, without any apparent vascularity whatever. Its effects in intercepting the entrance of the rays of light into the eye are easily understood,—effects the more complete, in proportion as the opacity occupies a more central position, or a greater portion of the cornea: when it is spread over the entire cornea the blindness is total. When the albugo is small, even though it be situated in the centre of the cornea, vision is still exercised, as the light passes in at its sides; and in this case, the sight will be best in obscure places, owing to the greater dilatation of the pupil. The albugo produces neither depression nor elevation of the cornea, two states which characterize respectively the former, the Leucoma, the latter pustules on the cornea. It differs also from the Nebula in its being opaque.

The disease depends upon the deposition of opaque lymph in a structure, which, for the due exercise of vision, should be translucent. Whatever, therefore, can give activity to the absorbent vessels of the part will be calculated to remove it. In young persons, in whom absorption is very active, the removal of these opacities is often effected either spontaneously, or in consequence of the treatment adopted. The reverse of this is observed in persons of advanced years. But it should be observed, that their curability depends often on other conditions that have no relation to the age of the person. Where the deposition of lymph is lightest, the cure is, *cæteris paribus*, the most certain; where the deposition is considerable, less so; and where, with the deposition, the laminæ of the cornea have become adherent, least of all, as the cicatrix cannot be obliterated. It is sometimes complicated with staphyloma, and other affections of the globe of the eye.

During the inflammation of the eye the effusion of lymph is combated by the usual remedies. (See Cornea.) When the active state has passed away, topical applications must be had recourse to to excite the absorbents. For this purpose a great variety of substances, of various forms too, have been recommended. That great compiler of remedies, Pliny, boasts of the good effects of the gall of sheep, pike, and barbel, applied to the cornea with a camel-hair pencil three or four times a day; he extols in the same manner various resins: but these remedies are now laid aside. Dry collyria, composed of calcined alum, and sugar finely powdered; calomel and sugar, which Dupuytren used to recommend; nitrate of potass, or oxide of zinc and sugar candy are now used with good effect; they are applied by the insufflation into the eye, of a small quantity once or twice a day, through a quill. Cloquet employs the oxide of bismuth in the same way, a seton being established at the back of the neck at the same time.

Scarpa recommends the following collyrium:—Ammon. Muriat. ℈ij.; Cupri Acetati, gr. iv.; Aquæ Calcis, ℥viij. Misce. The fluid is allowed to stand twenty-four hours, and is then filtered. He praises also the following ointment: ℞ Oxide of zinc, ℈i.; aloes and calomel, a.a. gr. ij.; fresh butter, ʒss. Jannin's ointment is also employed, with other ointments and washes, in which the nitrate of silver, the sulphate of zinc, the tutia preparata, alum, &c. &c. form the chief ingredient. The topical treatment should be persevered in for three or four months to produce the dispersion of the opacity; and in many cases it cannot be effected by any means that we can employ. (See Cornea.)

(*Wm. B. Costello.*)

ALCALI, a word of Arabic origin, from *al*, "the," and *kali*, the name of the *salsola soda*, a plant which contains a large quantity of one of the principal alkalies—*soda*. The mineral alcalies are employed in surgery; and, in the pure and concentrated state, they exercise the most powerful action on the living tissues, producing vesication, superficial or deep eschars, and even total disorganization, according to the length of time they are allowed to remain in contact with them. On account of this property they are employed for external use in opening abscesses, when the skin has been thinned to a considerable extent, and all but disorganized, to establish issues, to check luxuriant granulations, to arrest phagedenic sloughing, as in hospital gangrene, malignant carbuncle. (See Caustics, Cauterization.)

ALCOHOL, an Arabic word signifying any thing *very subtile, much divided:* in this sense it was formerly applied to fine and impalpable powders. It is now applied only to the products of the vinous or spirituous fermentation. From its great volatility it is employed externally in lotion, as a refrigerant, to check rising inflammation from burns, blows, sprains, contusions, &c.; in fomentations, united with camphor, as a resolutive, tonic, and antiseptic; as a stimulant in syncope, in frictions to the temples, region of the heart, and nostrils; and in injections with water into the tunica vaginalis, for the cure of hydrocele. Harris speaks favourably of its application in cases of erysipelas, painful inflammation of blisters, in gangrene, &c.

ALGALIE, a word of Arabic origin, signifying a tube, or hollow cylinder. (See Catheter.)

ALESE, or ALEZE, Fr. *linteum*, Lat. (from ἀλέξω, "I preserve,") *a guard*, Eng. A name given by French surgeons to a sheet arranged into folds, and thus placed under the patient, in order to protect the bed. Several advantages are secured by the timely use of the aleze, viz., the comfort of the patient who is freed from the contact of pus, sanies, and all excrementitial matters which, if allowed to accumulate, would become offensive and dangerous to health; cleanliness about him is easily kept, and the economy so desirable in public establishments is judiciously provided for. Linen sheets that have been softened by wear and freed from rough seams are the best for this purpose.

The manner of arranging the aleze, in cases where the dejection of excrementitial matter is abundant, and at the same time involuntary, as in serious wounds of viscera, or after parturition, is as follows:—the sheet being already made up into folds, one end of it is carried under the patient, beneath the part where the bed is liable to be soiled, the rest is folded up under the bed-clothes, or left spread across the bed; when the first portion is soiled, it is drawn from under the patient and a clean part takes its place; the soiled part is rolled up, according as it is withdrawn, until the whole length of the aleze has passed under the patient; a fresh one is then procured, and being attached with pins to the first, is drawn under the patient in the same manner. The heads of the pins, used for this purpose should be placed in the direction in which the aleze is drawn, otherwise the patient may be pricked or wounded by them.

When the liquid matter from a wound is so profuse as to be likely to penetrate through the folds of the aleze, the bed should be protected by a piece of oil-cloth which, when soiled, should be changed and washed for fresh use.

Sheets thus folded serve for several other uses in surgery; they are employed in all important operations, such as the amputation of limbs, cutting for the stone, opening abscesses, &c., to receive the blood, urine, or pus which may escape.

ALPHONSIN, a bullet forceps, so named from its inventor, Alphonso Ferri; it is said also to have been invented by Andreas à Cruce. These forceps have been frequently reproduced under various forms, and palmed off as new inventions. In these latter times, Civiale's invention of an instrument for the comminution of stone in the bladder, has been attributed to this source by persons who, with more industry than candour, were desirous of depreciating the importance of his labours. The Alphonsin has served as the model for Thomassini's, Hunter's, and other forceps of this kind, and consists of a tube terminating in three branches, which separate from each other by their elasticity, and which are again brought together and closed, by being received in another tube.

ALUM, *alun*, Fr. *Alaun*, Ger. The name is of Arabic origin. Alum is a salt, consisting of sulphate of alumen with potass and ammonia. It occurs in large, white, semi-transparent masses, or in octahedral crystals, and has a sweetish, astringent taste. Its use in medicine is of very great antiquity, and at one time it may be said to have been the chief ingredient in most external applications. It is employed both internally and externally. As a styptic solution, it is made use of to arrest capillary hæmorrhages from the mucous membrane of the nose, mouth, vagina, and uterus, and from bleeding surfaces. In obstinate epistaxis of young persons the aluminous solution may be aspired into the nostrils, or the alum may be snuffed up, five or six times a day, a few grains at a time, in fine powder. It has been also successfully employed in the form of injection in uterine hæmorrhage persisting after parturition. Smellie recommends a sponge, steeped in a strong solution of alum, to be passed into the vagina. The hæmorrhoidal flux may be checked, when immoderate, in the same way, or by the insertion of a plug well powdered with the alum. In the leech-bites of children it will often stanch the blood, and in situations where the practitioner would prefer keeping cauterization or compression in reserve, a small pointed cone of alum, applied and kept to the bleeding source, will be often sufficient to stop the flow of blood. The hæmorrhage following the extraction of a tooth may be stopped in this way. It is employed also, in very small quantities in collyria, to astringe the vessels of the conjunctiva, when varicose or chronically engorged. St. Ives made use of alum in pterygium and albugo, in the form of a powder, composed of calcined alum, sugar, and phosphate of lime. In powder, with powdered gum arabic, it has been used by insufflation in the back of the mouth, the pharynx, and top of the larynx, with a view to absterge, or detach the membranous flakes that are thrown out in some of the inflammations of these parts, as in the croup, angina, gangrenosa, or diphtheritis. Bretonneau, adopting the views of Areteus respecting the efficacy of alum in arresting these affections, obtained the most signal success in croup, which had ravaged certain departments of France as an epidemic in 1828. The powdered alum was blown into the back of the mouth, on the tonsils, pharynx, larynx, and backwards up the nostrils; this was repeated five or six times a-day, producing retching, and abundant flow of saliva for ten or fifteen minutes. From the first applications, the formation and extension of the false membranes are checked, and in two or three days a favourable termination is induced. This treatment is also successful for the same form of exudation when it occurs on the nipples, external organs of generation, &c.; as well as in the pruritus of these organs.

In the relaxation of the tonsils and uvula, and in the aphthous state of the mouth, it may, united with honey, or in the form of gargle, be advantageously had recourse to. M. Bennati published a work on the utility of aluminous gargles in some states of aphonia; and Dr. Bureaud Rioffrey in his Memoir on Laryngitis bears testimony to its value as a remedy in these cases, and in restoring the vocal powers.

Combined with white of egg and camphorated spirit, it forms a liniment, which is useful as an application to chilblains, and to protect parts from the ill effects of pressure in prolonged decubitus.

When calcined it has slight catheretic properties, and is employed in old ulcers, in which the granulations are pale, soft, cellular, and easily made to bleed; and also in the soft, moist excrescences that arise in the neighbourhood of the anus, and on the lips and inside of the prepuce. When used for this purpose, the parts are slightly powdered over with it; its action as an escharotic, however, is too feeble to be relied on.

(*Wm. B. Costello.*)

ALVEOLES. The cavities in the alveolar process of the superior and inferior maxillary bones, in which the roots of the teeth are inserted. For an account of the diseases of this part, which are intimately connected with those of the teeth, see "TEETH, DISEASES OF."

(*T. Bell.*)

ALVINE, OR ALIMENTARY CONCRETION. A section only of the general subject of FOREIGN BODIES is treated of under this head; namely those to be described hereafter, which are developed in the intestines. The qualitative term "alimentary" will be sufficient to show that we do not in this article include biliary concretions, which are very different in their nature and origin. Mention however will be made of them incidentally as they may become nuclei of the alimentary concretion, strictly so called.

Substances of this description have been occasionally found within the stomach or intestines of man or quadrupeds after death; or they have been discharged during life by the effort of vomiting, or by straining at stool. Such substances are not equally common in every part of the alimentary tube; their most common seat is at the commencement of the larger intestine, near to its termination in the anus, or in the segmoid flexure of the colon, where they have been frequently lodged for a very considerable time, obstructing, to more or less extent, the passage of the fæcal matter, thereby deranging the functions of the digestive apparatus, and ultimately causing great distension of the bowels, which is often succeeded by acute pain, febrile symptoms, inflammation, ulceration, and the death of the animal.

It may perhaps be objected to the term *alvine* that it conveys an imperfect idea of the seat of the obstruction, which is not invariably in the alvus or belly, so that if the term alimentary were substituted for alvine, a more accurate idea would be formed of the seat of the affection.

We speak of salivary, biliary, pancreatic, prostatic, and urinary concretions; and we speak of concretions being seated in the gallbladder or biliary ducts, of urinary concretions in the kidney, ureter, bladder, or urethra, and therefore we should speak of alimentary concretions in the throat, stomach, and the small and large intestines. Dr. Mason Good, in his Nosology, (page 50,) speaks of enterolithes, from the Greek word *ἔντερον*, and he makes mention of stony concretions in the stomach or intestinal canal. But his nomenclature appears to me exceptionable, because it seems to me to convey an incorrect idea of the nature of these substances, which, it might be inferred from his note, are formed by a morbid action occasioning the deposition of lime. He says, "Almost all animals are endued with a power of separating or secreting lime and other earths from the blood for particular purposes; as that of forming a shell-covering in insects and worms, and of giving hardness to the bones in other animals. Under a morbid action of single organs, or of the system generally, this is often secreted in an undue quantity, and poured forth into cavities where its accumulation and crystallization must be attended with mischief. Such, at times, is the case in respect to the stomach and intestines."

I have not had the opportunity of examining any concretion found in the alimentary canal which falls precisely under the description of enterolithes given by Dr. Good. It should be observed that the inferior animals, from the nature of their food and their coverings, are much more liable to this affection than man. These concretions are by no means unfrequent amongst horses, oxen, deer, and other quadrupeds that live on grass and other vegetable matter; and, on the other hand, as far as I know, they never occur amongst carnivorous animals. That their production also is connected with the covering of the animal is obvious from the fact that those concretions or balls, as they are commonly called, are by no means uncommonly met with in the stomachs of horses, oxen, calves, and deer, and these are found to be composed chiefly of hairs corresponding in all respects to those on the skin of the animal, and cemented together by the mucus and saliva of the throat. That the kind of food gives a predisposition to the formation of these extraneous bodies, may be inferred from the circumstance that such concretions are much more common in Scotland than in any other part of Europe, oaten bread constituting a principal part of the food of the inhabitants of many parts of this country; a conclusion which seems to derive support from the fact, that these concretions have been but rarely spoken of by the medical authors of Holland, Prussia, Italy, France, Germany, and England.

The museum at Leyden, formed of the joint anatomical collections of Rau, Albinus, Ledeboer, Van Doeveren, and part of the museum of Ruysch, and of the numerous dissections of the pupils of that school, contains, according to Dr. Edward Sandifort, only one specimen of an alvine concretion, and that was found in the ilium.

Dr. Walter of Berlin has published, in three large quarto volumes, a descriptive catalogue of the Anatomical Museum which he sold to the King of Prussia, but has described only one case in which he met with an alvine concretion, "qui inter membranam muscularem et nerveam ventriculi hæsit."

Morgagni has published, in his Thirty-seventh Letter, and Twenty-fourth Article, the histories of several calculi which he met with in the alimentary canal; but from his description of these, I am inclined to suppose that the greater part of them had been formed originally within the gall-bladder, or biliary ducts, and had passed afterwards into the intestinal canal.

He has described very accurately the external characters, and also the internal structure of biliary calculi. He observes, speaking of those calculi found in the intestinal canal, " Interna substantia meros ostendebat circulos striis intersectos ;" and in another passage he adds, " Interius ex circumjectis stratis compactos, et propius centrum ex striis radiatim pergentibus quas inter disjectæ erant albæ splendentesque particulæ." He adds, " Facile pro biliariis habeas." Lieutaud of Paris has described, in his *Historia Anatomico-Medica*, nine cases taken from other authors, in which what he calls *lapides* were found in the stomach ; and, in the 77th page of the same volume, nine cases, also borrowed, in which *lapides* were found in the intestinal canal. Portal, from the manner in which he has expressed himself in the fifth volume of his Anatomie Médicale, seems to have met with only one example of an alvine concretion within the stomach, and only one case of a concretion within the intestines, which he observes was *bileuse*.

In the German Ephemerides, several cases are described, in which what are called calculi were found within different parts of the alimentary canal[1]. Haller has not described a single case in his Opuscula Pathologica. Dr. Baillie, in his Morbid Anatomy of the Human Body, says of calculi in the stomach, " they have never come under my observation, and are to be reckoned very uncommon[2] ;" and he adds[3], " Calculous matter has sometimes been known to be accumulated in some part of the cavity of the intestinal canal, especially in the great intestine ; but this has not come under my own observation, and, at least in the human subject, is a very rare occurrence." And in that very rich repository, the Museum of the Royal College of Surgeons of London, of which a catalogue has been lately published, there is but one specimen of an intestinal concretion, which was taken from a horse.

In the Lithologia of Martin Schurig, published at Leipsic, there are only three or four cases of calculi in the alimentary canal mentioned ; but he quotes from many other authors. He appears to me to have arranged under one head extraneous bodies that have been swallowed, and alvine concretions ; for he names some of those substances which have been passed by stool, or been found within the intestines, *silices*[4], others *lapillos durissimos*[5], others *albicantes, rufos, griseos, tophaceos*[6], and others, as he says, were like biliary calculi. He seems to have met with but one case in which the concretion was like to most of those in the Museum of the University of Edinburgh, which he calls *substantiæ raræ et spongiosæ, magnitudine dimidii ovi*[1].

A complete view of the whole subject of alvine concretions must necessarily include those which are found in the intestines of quadrupeds ; but as that section of the subject would be inadmissible in a work of this nature, we shall confine ourselves chiefly to those which occur in the alimentary canal of man.

*Concretions found in the human alimentary canal.*—The concretions found in the alimentary canal vary considerably in their physical and chemical properties, and may be classed as follows : The first class comprehends such concretions as are formed of a number of very small vegetable fibres, being composed chiefly of the husk of the oat, held in union by a tenacious mucus ; in some concretions of this description, the centre or nucleus is sometimes found to be a cherry or prune stone, a small fragment of wood or bone, or a little gravel ; and, according to some authors, a small biliary concretion, or a small portion of adipocire. In some, but by no means in all such concretions, there are a few white, thin, concentric, laminæ, which are either phosphate of lime, or the ammoniaco-magnesian phosphate. When such concretions have attained a considerable size they are of irregular shape, sometimes tuberculated, and resembling a mulberry, and sometimes incrusted by a coating of phosphate of lime, or ammoniaco-magnesian phosphate, of two or three lines in thickness.

The second class of concretions, which is much more rare than the first, bears some resemblance to it, being composed of a number of cherry or prune stones or gooseberry seeds cemented together by a tenacious mucus. Concretions of this description have also been described by Mr. Children, (Phil. Trans. 1822,) and he has given a case where such a concretion proved fatal a very short time after the patient had eaten a large quantity of plums.

The third class differs essentially from the two preceding, being composed of vitiated bile, saliva, or pancreatic juice, and are not primarily formed within the alimentary canal, but find their way into it through the ducts proper to the salivary glands, pancreas, or liver.

The fourth class comprehends those concretions which are composed of a cetaceous substance ; they have neither the specific levity, crystallised form, colour, nor bitter taste of gall stones, and are probably formed in the intestinal canal ; an opinion which receives weight from the case of a lady, who, after having swallowed a considerable quantity of olive oil, constantly voided a number of globular concretions, " varying in size from that of a small pea to the bulk of a moderate grape, of cream colour, and slightly translucent, of a sufficient consistence to preserve their form, and to bear being cut by a knife, like soft wax ; the second case, that of a girl four years and a half old, who appears to have had a power of secreting oil in the intestines, and of discharging it per anum. At three years old her mother observed something come from her as she walked across the room, which, when examined, was found to be fat in a liquid state, which concreted when cold. Ever since that time to the present, she has voided at intervals of ten or fourteen days, the quantity of from one to three ounces, sometimes pure, at others mixed with fæces; when voided it has a peculiar yellow tinge, and is quite fluid, like oil. Her appetite and spirits are good, and her flesh firm; her belly rather tumid, but not hard; she is subject to occasional griping."

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[1] Ephem. Nat. Cur. Dec. I. Ann. II. Obs. 89. 130. et variis locis.

[2] Vide Morbid Anatomy, 2d Edition.

[3] P. 194. [4] Vide p. 191. [5] Vide p. 154.

[6] Vide p. 154.

[1] Vide p. 157.

Cases of a similar description are recorded in the *Act. Nat. Cur.*, vol. iii., obs. 51; by Dr. William Scott, in the *Edinburgh Medical Commentaries*, vol. iv. p. 334; by Dr. Elliotson, in the *Philosophical Transactions*, 1813, Art. 21; by Dr. Kuntzmaur, of Berlin, (*Journal der Pract. Heilkunde*, July, 1821) and by Dietrick, and several others.

The fifth class comprehends those concretions, the nature of which was discovered by Dr. Kennedy of Glasgow (see *Medico-Chir. Journal* for Sept. 1817), and which Dr. Ure has described as similar in colour to ambergris.

The sixth class comprehends such concretions as are composed of magnesia or chalk, and which have been found in the alimentary canal of persons who for some time have been in the habit of taking considerable quantities of these earths.

The seventh class is that which comprehends those concretions which are described as having been discharged by vomiting by persons who had suffered severely from gout: but of these I know nothing, not having yet seen them.

The last class of concretions found in the human alimentary canal is almost entirely formed of the fibrine of the blood, which is incorporated with a certain proportion of the red globules, and occurs sometimes when the mucous membrane of the intestinal tube has been attacked by acute inflammation, as in severe cases of dysentery[1].

Having given the preceding brief enumeration of the different kinds of concretions which are occasionally found within the human alimentary canal, I shall now direct the attention of the reader more particularly to the consideration of the first class.

The following observations on this class have been made chiefly from the large collection of these substances in the Anatomical Museum belonging to the University of Edinburgh. For the chemical analysis of these substances, I am indebted to those distinguished chemical philosophers, Professors Thomson of Glasgow, Traill of Edinburgh, and Dr. John Davy.

Whether I am correct or not in my notion of the cause of alimentary concretions, I shall not at present stop to inquire; but when once formed, it cannot be doubted, that the bowels would, from the admirable mode in which the performance of their functions is provided for, eventually eliminate them, if the retention and enlargement of those foreign bodies, were not favoured by the perversion of these functions, the narrowness of the intestinal tube, its numerous flexuosities, and the depths of the *valvulæ conniventes.*

*Alimentary Concretions:—Number.*—It generally happens that one or two concretions only are found in the human alimentary tube, though the rule admits many exceptions. My father, in his lectures, used to make mention of the case of a boy of twelve years of age, in whose colon he could distinctly feel twelve concretions of different sizes, and these were moveable. Dr. Malcolm, of Perth, within these few weeks has favoured me with two, of sixty concretions, which he collected from the same individual. Some of the smaller ones had been discharged by the anus, but the larger were found after the patient's death firmly impacted within the larger intestines; the following is a copy of the letter I received from Dr. Malcolm, when he sent to me the alvine concretions.

"John Bett, shoe-maker, Æt. 21. Has been ill nearly two years, with complaints, which at different periods, had been treated by various medical men, as cholic, hysteria, inflammation, flatulency, &c. &c. During the accessions of his complaint, his sufferings were horrible, and so frequent in recurrence, that he was totally incapacitated for work.

"I saw Bett frequently during these attacks; the convolutions of the intestines could be distinctly felt, swelled and knotty, as from flatus; but touching or handling the knots gave him acute pain. I prescribed for him, ol. terebinth., aloetic medicines, tinct. valerian., &c. without giving him any relief. In September last, whilst taking bitter infusion, calculi began to come away by stool, and have continued to do so till very lately to the number of thirty-eight. He is poor, and consequently his diet has been such as is usual with peasants in Scotland, namely, oatmeal and potatoes, &c. He now enjoys perfectly good health."

This patient died a year after the date of this letter. Leave having been obtained to examine his body, several large concretions were found, firmly impacted within the transverse arch of the colon.

A considerable number of concretions have also been found within the stomach. Lazoni met with ten such bodies, and Bilquer has related the history of the case of an old man, in whose stomach he met with thirty calculi of different sizes. It is right to observe, that these alvine concretions are not so frequently met with in

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[1] A concretion similar to the bezoar obtained from the stomachs of the smaller ruminating animals has been said to have been found in the human stomach, but of this I entertain very considerable doubt. Perhaps this opinion is advanced on some such case as the following:—a boy, sixteen years of age, was in the habit of swallowing hair,—he became a prey to hectic fever, and died; on opening the body, the stomach and small intestines were found to contain masses of hair, arranged in concentric layers; the nucleus of one of those balls was a cherry-stone. (*Journal de Méd., Chir., et Pharm.*, 1779, t. lii.)

Glasgow as in Edinburgh. In the Hunterian Museum of the former, there is a very small collection of alvine concretions, amounting to fifteen only; and Professor Burns has informed me, that in the course of his very extensive practice, "he had met with no case he could ascertain by the progress, or the discharge of the concretion, or by examination after death, to have been one of intestinal concretion; nor had any of his medical friends met with a case of intestinal concretion, which they could establish to be such, by *post mortem* examination."

*Physical characters of alimentary concretions:* —*Size.*—The size of these concretions is extremely *various.* Some do not exceed that of a garden pea; but others are as large as an orange. My grandfather has described several he met with, as being five, six, seven, and even eight inches in circumference; and from the body of a woman, who consulted my father, a concretion was taken out of the colon, three years after by Mr. Renton, surgeon, in Pennycuick, which weighed four pounds.

*Figure.*—The large concretions are more irregular in figure than the small; the former have an outer crust, which gives them a very unequal surface; some seem to be made up of a congeries of smaller calculi. This may be probably owing to the additions made to the surface of the calculus during the time it remains fixed within a certain portion of the intestinal canal. Thus a calculus which had been moveable becomes fixed, the convexities on the surface becoming adapted to the concavities within which the concretion has been lodged. Some alvine concretions are perforated by a number of small holes like certain corals. The smaller concretions are somewhat of an oval or spherical shape, slightly flattened at the sides, which is probably occasioned by the friction and pressure of one concretion upon another; and some impress each other so much as to resemble cup and ball. In a case described by my grandfather, in which several concretions were passed, "the largest of the five balls, which was the first voided, was five inches in circumference, and something globular, but with several prominences and flat surfaces. Most of the flat parts had a smooth shining tartarous thin coat; the rest of it was more rough, and of a spongy appearance. The two last brought away were less in bulk, and without so much tartarous crust; the two small ones were all covered over with a shining tartarous crust, which in several places was prettily variegated with different shades of an ashy colour. One of them had some resemblance in shape to the shell of a tortoise; the other, the smallest, to two pyramids, joined by a common base[1]."

*Colour.*—The colour of the smaller calculi differs from that of the larger, the former having no external coating. The colour of the surface of thirty-five of the concretions in the Museum of Edinburgh, is nearly the same, resembling that of bad yellow ochre of iron; whereas, most of the larger calculi are encrusted with earthy matter, of a coffee or purple colour, and others by white matter which seems to have been deposited in thin successive layers.

*Structure.*—The human alvine concretions which were collected by my father, are, with a few exceptions, similar as to structure; all are more or less porous, and somewhat like dried sponge; when examined by the aid of a good magnifying glass, they seem to be made up of a number of very small fibres, intimately interwoven with each other, like those in a hat, or in chamois leather, and the interstices between the fibres are filled up by earthy matter.

In consistence, these concretions resemble dried sponge, and, like it, may be cut with a sharp knife; but when a blunt knife is used, the dried concretion crumbles to pieces. There are small holes on the surface of a few concretions, which pass for about half an inch into the substance of the calculus; and in one of the specimens there were twelve cavities of a cylindrical form, which penetrate as far as the very centre of the concretion, and were filled with a viscid mucous.

The external crust of the larger concretions seldom exceeds two or three lines in thickness, and is deposited in layers, which when dry are friable, and apt to split and crack off. In some of the specimens the external earthy crust covers only a part of the calculus. Upon making a section of most alvine concretions, they are found to be composed of distinct layers of a yellow or brown colour, but in some the layers do not pervade every part of the calculi; in some, there are no layers observed. But those found in the deer form an exception to the above observation, for some have a radiated structure, like biliary calculi. The lamellæ, which are about two lines in thickness, are generally of a lighter colour than the rest of the calculus, but sometimes they are darker. The external form of the calculus seems to determine the course of the layers, or *vice versâ.* If the calculus be of an oval shape, the component layers of it follow a similar direction; the surface of the layers is disposed so as to correspond in its course with the irregular surface; the lamellæ, upon a minute examination, do not form one continued line, as in biliary or urinary calculi. In the centre of the concretion, a prune or a cherry-stone, or a small piece of bone, or a biliary calculus, is generally found. Upon a minute examination of all sections of the human concretions, which are collected in the museum of the University of Edinburgh, a nucleus may be distinctly observed. In some of these concretions the nucleus is large and very easily seen, being a plum or cherry-stone, or a fragment of wood or bone; but in the majority, the nucleus is small and not very apparent, and looks very like a number of particles of common sand, held together by a viscid mucus.

In some there are cavities, filled by small grains of sand adhering to each other by several small fibres. In the upper part of some of the concretions many distinct white shining crystals are visible. By exposure to the air, the internal part of the concretion acquires a darker colour.

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[1] Vide Quarto edition of his works, p. 668.

From what has been stated as to the structure of alvine concretions, it is probable that these substances are formed upon an extraneous body, and also that they increase in bulk, in consequence of the deposition of successive strata; and as such they are justly called concretions, being composed of parts of the food or other substances, deposited in their passage through the alimentary canal.

In order to throw farther light upon the nature of concretions of the first class, I subjoin a description of the more common kind, drawn up according to the manner of Werner, by my colleague, Professor Jameson:—

"No. 1.—*Colour* of the cut surface, intermediate between yellowish brown and chesnut brown; *shape*, tuberose, and perforated; *lustre*, dull; *fracture*, delicate, promiscuous fibrous; *transparency*, opaque; *streak*, not altered in the streak; *hardness*, yields readily to the nail, and receives an impression from the finger; *tenacity*, sectile; *frangibility*, difficultly frangible; *feel*, feels fine and rather meagre. Is light.

"N. B.—The external shape is coated with a dark brown coloured crust, which is soft, brittle, resinous in the streak, and light. Some parts of this crust are covered with an ash-grey coloured crust, which is softer than the brown crust, and is sectile.

*Chemical analysis of alvine concretions.*—Morgagni[1], Van Swieten, Lassus[2], and Richerand, have supposed these substances to be indurated fæces.

Cadet[3] and Portal[4] are the only authors whose experiments on this branch of the subject merit mention. But Cadet made his experiments when chemistry may be said to have been in its infant state, for chemical analysis had not arrived at the perfection it has now attained; and I must doubt whether Portal was sufficiently qualified as a chemist for undertaking the analysis of such compound substances as alvine concretions; and whether his experiments were of such a kind as to enable him to draw just conclusions respecting their nature. If the experiments of Cadet, who was a distinguished chemist of his day, were rude and imperfect, we may reasonably infer that those of Portal are liable to still greater objections.

Under these circumstances I thought it of great moment that some competent modern chemist should examine the large collection of alvine concretions formed by my father, with the view of determining whether they are merely the indigestible part of the food, or an agglutination of the various substances licked off, from the animal's skin, earth or any other substance the animal may have chanced to swallow along with its food, or substances *sui generis*, and totally different from any other animal or vegetable production.

In the collection above alluded to, there are forty-two specimens of alvine concretions which were obtained from the human body, several of which I was so fortunate as to prevail upon Dr. T. Thomson to examine. His labours have thrown much new light upon the subject, as the reader will find from the annexed report which he sent me.

"The calculi which I examined are of a much more compound nature than I expected, and contain two substances, of a nature quite peculiar, or at least with which I was not before acquainted. The following observations will convey a general idea of their nature and composition.

"1st. At first, they swim in water; but that is owing to their numerous pores being filled with air; as soon as it is expelled, they sink to the bottom and remain there. The specific gravity I found to vary in different specimens, from 1·376 to 1·540. I consider 1·400 as about the average specific gravity of the whole.

"2d. When left in cold water they soon communicate to it a brownish tinge. The water was found to have taken up the following substances:—1. Albumen, which was separated in white flakes by boiling the water. 2. A brown substance, which I consider as peculiar; it dissolved, at first, in water, but became nearly insoluble by the slow evaporation of the liquid; it dissolved in alcohol; it approached most nearly, in its properties, to vegetable extractive; but the quantity which I obtained was too small for an exact examination. 3. Common salt, which crystallized when the water was allowed to evaporate spontaneously in an open vessel. 4. Phosphate of lime, which was precipitated by ammonia. 5. Sulphate of soda, in a very minute proportion. 6. Perhaps, also, sulphate of lime; but the quantity of this salt must have been very small.

"3rd. Alcohol dissolved the peculiar brown matter, and some of the salts, but extracted nothing particular.

"4th. Potash ley separated the albumen, the brown matter, and perhaps some of the salts.

"5th. Muriatic acid separated a notable proportion of phosphate of lime.

"6th. After the action of all these re-agents, there remained behind a peculiar substance, having the colour and texture of the calculus. Ten grains of calculus left 1·2 grains of this matter; it was very light, having the appearance of cork, or rather, of the peculiar fungus, which is used on the continent for tinder, and which the French call *amadou;* it was in very short threads. This substance is tasteless, insoluble in water, alcohol, æther, potash ley, and muriatic acid: it blackens sulphuric acid, and is dissolved, being partly reduced to charcoal. In nitric acid it dissolves very slowly, and only when assisted by heat, and hardly effervesces. When the solution is evaporated to dryness, a whitish residue remains, which has a bitterish taste, and is imperfectly soluble in water. Nitric acid does not convert it into any of the vegetable acids, though digested on it repeatedly. This substance burns with a slight flame, and rather like a vegetable than an animal body. It is undoubtedly of a peculiar nature, differing from every animal and vegetable substance hitherto examined. Its insolubility in potash ley distinguishes it readily from wood. It has no resemblance to any animal substance whatever.

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[1] Epist. 37.

[2] Patholog. Chirurg.

[3] Mém. de l'Acad. Royal. de Chir. tom. iii. p. 15.

[4] Anat. Méd. tom. v.

"7th. The calculi consist essentially of alternate layers of this peculiar substance, and of phosphate of lime. Sometimes the substances are intimately mixed, instead of being in alternate layers. The albumen and brown matter seem to serve as a cement; the other substances are in a small proportion. The crust on the outside of some of the calculi consists of phosphate of lime, mixed with a brown animal matter. In a few specimens I observed crystals of phosphate of ammonia and magnesia, upon the outside crust of the calculi; but these appearances are uncommon.

"Such are the constituents of the concretions as far as examined. In two calculi the phosphate of lime amounted to rather more than half the weight of the whole. In one specimen the albumen separated was one twenty-seventh of the whole; but I have reason to believe that a portion still remained. The quantity of common salt and sulphate of soda was small. I could detect no potash by the test of muriate of platinum. Neither was there any ammonia sent, or carbonate of lime, both of which I expected to find. I examined the calculi carefully for uric acid, but found none. Neither could I detect any urea, substances abounding in urinary calculi.

"The preceding details are sufficient to show, that the calculi in question are of a very different nature from any hitherto examined. They are of a much more insoluble nature than urinary calculi; indeed, no solvent exists, except of a nature so corrosive that it could not be applied."

Dr. Thomson examined five of these concretions, Dr. Traill one: the several specimens underwent different treatment—some of the results are selected. Of those examined by the former gentleman, No. 1 furnished, in 100 parts, 78·0 fibrous matter: ·5 yellow colouring matter: 21·5 saline matter.

No. 2 furnished 7·0 grs. saline matter: 1·4 brown fæcal matter: 17·2 resinous matter: 74·4 fibrous matter. In the other three, the relative proportions of these elements fluctuated.

In Dr. Traill's analysis (proportions not exactly stated,) the result was—1, vegetable hairs, or filaments; 2, mucous, or muco-extractive matter; 3, magnesia; 4, lime. "The first," says Dr. Traill, "forms by far the principal part of the calculus; the second is the cement that binds these together, aided by the small quantity of magnesia, and still more minute quantity of lime.

"This intestinal calculus seems to me to be precisely similar to those described by (I think) Wollaston, as derived from oatmeal. It is not, as has been supposed by some, the beard or awn of the oat, that contributes to their formation; but if we separate the whole husk of the oat we find, on the upper end of the farinaceous part of the seed, a beautiful silky *tomentum* or down, which, when put under the microscope, has the same appearance as that contained in the calculus, and has similar dimensions, both as to length and diameter."

From the preceding details it appears that, in different specimens, the composition of the alvine concretions varies, both as to their saline and their inflammable contents. The fibrous matter which they all contain seems, as Dr. Thomson, who first examined it, considers it to be, a peculiar substance; that obtained from the two first concretions being soluble in potash, approaches, by one step nearer, to woody matter, but it widely differs in the effect which heat produces, intumescing, and not retaining its form like wood. The resinous matter which the second contains may be also peculiar, but for this to be satisfactorily proved farther experiments are yet required. The analysis of these concretions throws, if any, but a very imperfect light on their formation. The most probable conjecture appears to me to be, that they are produced from the remains of the ingesta, during their stay in the large intestines. On this hypothesis there would be no difficulty in accounting for the saline ingredients, all of which exist in the fæces; neither would there be any respecting the formation of the resinous substance found in No. 2; it is, moreover, easy to conceive, and most natural too, that the fibrous matter, like the saline, is derived from the food. In opposition, it may be said, that the fibrous matter is a new substance; but, let this be granted, and it may nevertheless be contained in vegetables, and it would be desirable to examine those in most common use, with this object in view. The idea of the formation of these fibres in the intestines, from chemical changes there taking place, is difficult of conception, but the idea of this secretion is still more so.

It is deeply to be regretted that no clue is derived from analysis to assist us in their successful removal, during the life of the patient. Their size, in general, is so great before they create afflicting symptoms, and their solubility, even in the most active menstrua, so slight, as to banish all hope of relief from this source, however gravely it may be asserted in the *Dictionnaire des Sciences Médicales*[1], that biliary calculi, and intestinal concretions, may be dissolved by the use of fresh vegetables.

Since these analyses of alimentary concretions were made, experiments as to the chemical nature of these substances have been published by Dr. Marcet, Robiquet of Paris, and Drs. Ure[1] and Turner of London[2].

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[1] See *Dictionnaire des Sciences Médicales*, article 'Corps Etrangers,' t. vii., page 6.

According to Marcet, concretions, from the alimentary canal, consist of—in 100 parts, 25·20 animal matter; 3·90 resin; 5·16 ammoniaco-magnesian phosphate; 45·34 phosphate of lime; and 20·30 vegetable fibres. The vegetable fibres were cemented together by deposits of earthy matter.

*Causes which give rise to the formation of concretions in the alimentary canal.*—In the commencement of this article we alluded to some of the causes that favour the retention and increase of these concretions. The greater number of them being composed of fibres of the indigestible part of the food, of particles of sand, clay, or other extraneous bodies, and being most frequent in Scotland and Lancashire, where a good deal of oaten cake is used as food, it is legitimate to infer that this kind of food gives origin to the formation of such concretion. But this fact is not alone sufficient to account for their production, because, if it were, all persons that take such kind of food would be liable to suffer from the disease.

Two other causes are therefore probably superadded, viz.—a very weak state of the function of digestion, and also the presence of a nucleus which has been swallowed, and is retained for some time within the alimentary tube, the mucous coat of which is thereby much irritated, and its vessels, instead of secreting a healthy mucous fluid, secretes a very viscid mucus, which cements together the different indigestible particles that have been swallowed.

After a small concretion has thus been formed, it rapidly increases in bulk, in consequence of successive layers being added to it.

Among the higher orders of society, the taking magnesia for some time has often occasioned much irritation and derangement in the functions of the alimentary canal, because, when this magnesia does not meet with an acid to favour its discharge by stool, it meets with fresh quantities of the same earth, and a concretion is at length formed, which, in some instances, has attained very considerable bulk. It seems not unimportant to attend to these causes of the formation of alimentary concretions, because they show—1. The pernicious effects which sometimes result from swallowing cherry stones, or those of other fruits, or the seeds or husks of fruits, small fragments of bone, pins, and other extraneous substances. 2. The risk which individuals, afflicted by this disorder in its milder forms, when the concretion within the intestine is small and moveable, and may be discharged by the anus, incur, from continuing to live on oaten bread, or other kind of food which is indigestible, and may afford additional matter to the concretion. 3. The impropriety of giving horses the refuse of the flour, which is mixed with sand or particles of clay, a practice common amongst millers: and, 4. They prove to the grazier the necessity of rubbing the skins of oxen, cows, or calves, so as to remove all loose hairs, which the animal otherwise might lick off and swallow, and which, by concreting, form a nucleus, or add to the bulk of a small concretion within the alimentary canal. Lastly, in the case in which there is reason to suspect that where the concretion formed within the human alimentary tube consists chiefly of magnesia, the growth of it may perhaps be obviated, by giving up the use of magnesia, or by giving diluted sulphuric acid, which prevents the formation of such concretions, as, when combined with magnesia, it proves a purgative salt; such a precaution may, however, be deemed superfluous, as magnesia is generally given to remove acidity of stomach.

It is also evident that those concretions which consist of coagulable lymph, and which are not unfrequently found in the intestines of persons who have died from dysentery, are occasioned by inflammation of the mucous membrane of that tube, and the formation of such concretions may be obviated by the antiphlogistic regimen.

The formation of those concretions which contain a good deal of oily matter, has been imputed to oleaginous matter which has been swallowed, and which has not undergone the necessary changes within the *primæ viæ*. It is not improbable that they are formed by the secretion of an oleaginous substance, or by a chemical change on the fæculent matter after it has passed into the caput cæcum coli, or colon, for fat, in a concrete state, or in a state of fluidity, has occasionally been discharged by stool, by persons of different ages.

*Of the Symptoms.*—Substances in their course through the alimentary canal may not excite any symptom whatever; or they may be accompanied by sensations of extreme anguish. Alvine concretions prove a source of much irritation, and impair the functions of the stomach and intestines, exciting pain of variable intensity, sensibility of the entire abdomen, nausea, and severe vomiting; distention of the alimentary tube, inflammation, looseness with much griping, or constipation with tenesmus and tormina; hiccup, &c., the symptoms having a general resemblance to those produced by a strangulated hernia. The pain in the bowels is, in some cases, fixed to one part, being much more severe at one time than another, especially after taking acids, or food of difficult digestion; the ingestion of these substances is frequently followed by nausea and vomiting; dry skin; furred tongue; quick pulse, and other febrile symptoms, which, however, are transitory. Some patients are constipated for two or three days, and have, notwithstanding, a constant inclination to go to stool. Such is the case, more particularly, when the foreign body is stopped in the colon, or rectum, the fixed position, and distensibility of which, favour its stoppage. In these cases, there is not only the impossibility of voiding the excrements, but sometimes the urine itself is retained. The belly is meteorized, the colic pains and vomiting are severe; sometimes there is hæmorrhage, or oozing of purulent matter from the anus; if no remission of the symptoms can be procured, enteritis, peritonitis, and gangrene, supervene. Others have watery stools, and discharge with them a quantity of viscid ropy mucus, or blood, after which they are much relieved. Some patients who for years have been afflicted by this disorder, suffer much from a burning sensation at the pit of the stomach, and some discharge their stools involuntarily.

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[1] *Vide* Dr. Ure's *Chemical Dictionary.*

[2] *Vide* Dr. Turner's *Chemistry.*

Upon relaxing the parietes of the abdomen, a very hard, painful, globular tumour may generally be felt at the origin, or in the course of the large intestines; and very often at the sigmoid flexure of the colon.

The concretion is generally immoveable within the intestine; but often appears to change its place in consequence of the change of place of the intestine which contains it. Hence the change appears greatest where the concretion is in the small intestines, or arch of the colon, which, from the length of mesentery, or meso-colon, are very moveable. The digestive powers being in the progress of the disease much impaired, the patient becomes very weak and much emaciated; until at length from the continuance of the disease, he is reduced to a skeleton. The pulse, in the earlier stages, is but little affected.

When the disease has been of some duration, the pain in the bowels is constant.

Concretions have, in some cases, remained for years before they have been dislodged. When they are very large, and lodged, either in the transverse arch, or sigmoid flexure of the colon, they may be distinctly perceived. When the concretion passes into the rectum, it creates excruciating pain in the region of the pelvis and fundament, especially when the patient goes to stool, and the extraneous body may then be perceived during the effort of straining at stool, an inch or two above the anus; it will also be visible when the patient is sitting, or when the constipation has lasted several days.

In the more fortunate cases, the concretion, after exciting severe nausea and vomiting, has been ejected along with the contents of the stomach, or discharged by slool, or extracted from the rectum. It is not a little remarkable, considering the bulk of some of these concretions, that the intestinal canal is not, more frequently, completely obstructed. In the progress, however, of these cases the functions of the intestines become more and more deranged, and so much obstructed, that laxatives by the mouth, or clysters, are necessary to procure a passage.

Tumours occur in the tract of the alimentary canal from a variety of causes, the precise nature of which, if not ascertained, may lead to the most baneful consequences. I shall, therefore, enumerate some of the causes of those tumours which may be mistaken for concretions.

Amongst those which are most readily mistaken for alvine concretions, are masses of indurated fæces. Tumours of the omentum, or mesentery, incipient dropsy of the ovaries, anormal position of one of the kidneys, and scirrhous pylorus.

The following cases are submitted with a view to elucidate this point of diagnosis:—

Case 1.—I was desired by the late Dr. Kilgour of Musselburgh, to visit a man of seventy-three years of age, much emaciated, suffering very acute pain in the abdomen, which was much increased on pressure, and who had had no passage from his bowels for several days. His pulse was quick and hard. The relations informed us that he had been for many years subject to costiveness and stomach complaint. Upon examining the abdomen, several hard substances were distinctly perceived by the touch, a little above the left ilium; these hard substances, it was stated, had been distinctly felt by Mr. Cunningham, surgeon, at Tranent, and also by themselves, for eight or ten years.

Venesection, and large doses of purgatives were employed, but in vain; the patient died in six days after I visited him.

His body was opened by my assistant, Mr. Fyfe, in the presence of Dr. Kilgour and myself. All the viscera of the abdomen were found in a sound state, excepting the sigmoid flexure of the colon, on which there were several black spots; it contained a mass, which, on being minutely examined, proved to be fæces, very much indurated, and collected into a number of hard round tumours.

Case 2.—I was desired by Dr. James Anderson to visit a woman between thirty and forty years of age, who had had for three years a hard tumour about the size of a large orange, resting on the right ilium. The tumour, on pressure, could be made to change its place, but the attempt always gave a good deal of pain. She had had two children since this tumour had been first observed. The functions of the alimentary canal were not in the slightest degree deranged, and hence I was led to impute the swelling to incipient dropsy of the ovarium.

James G. Stirling, aged eight years, Oct. 24th, 1813,—about four months ago was attacked with pleurisy, for which the usual remedies were had recourse to, with success; immediately after this, there was accidently discovered in the right iliac region, a circumscribed tumour of very considerable magnitude, which gave slight uneasiness on handling it. The tumour seemed somewhat moveable, and was at times more distinctly felt, than at others. A course of laxatives was administered without any effect on the tumour; mercury was also used to a considerable extent, both externally and internally, with no effect on the tumour. After the mercury had been some time given up, the bowels being regular, and the child gaining strength, he was suddenly seized with a fit, during which he could not articulate; after this, he had evidently lost the power of voluntary motion of the right arm and leg, to a considerable degree; he became dull, had frequent vomiting, stupor, and other symptoms of hydrocephalus, which terminated in death on the 22nd of October. On opening the abdomen, the intestines appeared in a perfect state. On removing these from the right side, the caput coli was found higher up than usual, and partly behind *and between it and the groin*, the tumour was discovered which had occasioned so much anxiety to his attendants during his life. This tumour lay behind the peritoneum, which being removed carefully, a kidney of three or four times the natural size was brought into view. The ureter was very large, issuing from the pelvis of the kidney, but soon contracted to its usual size: it run across the psoas muscles, and was inserted into the bladder about the usual place. On examining the left side there was not a vestige of kidney or ureter. The bladder was much distended, and reached to the upper end of the kidney.

When the scirrhous pylorus is lower down in the belly than usual, which very frequently happens, it may readily be mistaken for a concretion in the intestinal tube, being a hard moveable tumour, and accompanied by great derangement of the functions of the stomach and intestines. I have been consulted where a tumour originating from this cause was seated near to the navel, and was supposed to be an intestinal concretion.

From what has been stated respecting the effects of alvine concretions upon the alimentary canal, it follows, that these may at first be moved from one part of it to another, but they at length become immoveable, a circumstance which merits the most particular attention, as it marks the progress of the disease, and points out the chance there may be of dislodging the concretion.

In consequence of the increasing bulk of the concretion, the obstruction of the intestines become daily greater and greater. Inflammation and febrile symptoms follow, and end in death.

*Appearances on dissection.*—In the milder cases, the intestines are found to be considerably dilated, above the place where the concretion has been lodged, and in some there is a distinct sac, the coats of which attain a considerable thickness. In one instance, the iliocæcal valve had disappeared.

The mucous membrane of the sac was much thickened and corrugated, so that the cavity which lodged the concretion seemed to be formed by a dilatation of the extremity of the ilium. The villi on the mucous membrane were not perceptible. Owing to the irritation of the concretion, the intestine is sometimes found contracted above and below the seat of the concretion; and in the cases described by Monro, Turner, and also by Horstius, the concretion adhered to the inner surface of the sac. On some occasions, where death has been occasioned by inflammation, consequent to the obstruction caused by the concretion, the inflammation has not been confined to the intestines, but has been found extending over the surface of the peritoneum, together with an effusion of coagulable lymph, and the different turns of the intestine in the vicinity of the concretion have been found adhering to each other, and to the neighbouring bowels. In a very few cases, ulceration of the intestinal tube has been detected allowing the concretion to make its way into an abscess. Such cases have been described by Marcet and Penada.

*Treatment.*—It has been already observed, that concretions lodged in the stomach have been occasionally discharged by vomiting, and those in the intestinal tube by the anus, especially when they are of a small size, and there is reason to expect the latter favourable issue, where they create considerable pain in sitting, or upon going to stool, which is a proof that the concretion is lodged in the rectum, a fact which may be ascertained by an examination by the finger, or a bougie passed into that bowel.

Concretions impacted within the alimentary canal generally give more or less uneasiness in proportion to their bulk, and when they give rise to severe colic, pain in the iliac region, or top of the os sacrum, constipation alternating with diarrhœa, or obstinate costiveness, much relief is given by the application of warm fomentations to the belly, and by emollients, into the composition of which warm olive or castor oil enters; and in order that they may fulfil their intention more effectually, the clyster is to be administered, whilst the patient rests on his knees and elbows, with the pelvis raised above the shoulders. Should the symptoms be more urgent, accompanied with febrile disturbance, the same mode of treatment is to be adopted as in cases of inflammation. When the symptoms subside upon the discharge of the concretion by the anus, the disease has probably been removed; but as in several cases there are two or more concretions lodged in the intestinal tube, the patient's case should be attentively watched. As concretions have been occasionally discharged by vomiting, emetics have been recommended; but though those of the milder description may not do harm, the more acrid may bring on ileus. Mention has been made by some writers of attempting to dissolve concretions lodged within the stomach or intestines; but owing to the nature of these substances there seems to me to be no prospect of relief from such a class of remedies; and I am not acquainted with any remedy which possesses, in the slightest degree, the property of dissolving the concretion, which would not materially injure the mucous membrane of the alimentary tube; so that much more is to be expected from the use of oily and emollient purgatives, combined with clysters; and these must be persevered in for a considerable length of time.

In the first and second editions of the book

I published many years ago, on the morbid anatomy of the gullet, stomach, and intestines, mention has been made of this mode of treatment, which was proposed by my father, and of which succeeding authors, particularly Dr. Copland, has spoken in laudatory terms.

The following is an extract from my book, and contains, in a letter to Sir A. Douglas, the history of one of the cases in which this mode of treatment was adopted.

" *Edinburgh, Nov.* 28, 1768.

" Sir,—Having carefully examined and considered Mr. M.'s case, I am altogether certain that his complaints proceed from a concretion lodged within the left side of the colon, of the same kind probably with those he passed some years ago, and of which I have in my possession about *thirty*, taken from different patients.

" As it is impossible to reach it from the anus, so as to extract it with a pair of forceps, the patient should carefully observe the following directions, by which it is hoped he may in no long time pass the concretion, or bring it past the turn of the colon into the rectum, so that it may be got hold of with an instrument, and extracted.

" He ought to take every night, at bedtime, a tea-spoonful, or as much of the lenitive electuary as shall be found sufficient to procure one loose stool; and in the morning a clyster, composed of an English pint of warm milk, to which two table-spoonsful of olive oil are to be added; and this should be retained for an hour, if possible, by lying in bed, with the buttocks raised by pillows.

" When he goes to stool, he ought, with his hand, to push the concretion downwards as far as he can, without raising considerable pain, and to sit over the steam of hot water, making efforts longer than is commonly necessary; and even when he is not at stool, he ought frequently through the day to work it downwards with his hand; and by squeezing as if he were at stool, or by putting his finger, or a feather, into his throat, to occasion such an effort as is made when we vomit.

" Once in ten days, or oftener, he should take a purgative, and on the evening of that day a laxative clyster; and when the clyster begins to operate, let him take an emetic, and go into the warm bath. A dozen or two of pills, made of Castile soap, in a table-spoonful or two of oil, taken every day, may probably be of considerable service. A flannel-shirt should be worn, and through the day a piece of fur should be laid upon the tumour. His diet ought to consist chiefly of bread, milk, soup, or broth, with a little fowl, jellies, or plain roasted or boiled meat. Moderate walking, or riding on horseback, will be of service; but fatigue is to be avoided. I believe I need not add, that excess in eating or drinking might prove highly dangerous.

" No chirurgical operation is to be performed, unless the concretion should altogether stop the passage through the guts, so as to bring on dangerous symptoms, such as could not be removed by medicines. In that case, indeed, an operation, though very dangerous, might be necessary."

The following year my father received the subsequent letters from his patient.

" *Dundee*, 20*th Feb.* 1769.

" My disorder rather increases. I am in continual pain; my appetite is quite gone; I get no sleep but from opium, which undoubtedly will soon reduce me very low; indeed, I am so already. The concretion still remains in the same place. In March I found the tumour a hand-breadth lower than it had been in November.

" I am, &c., John M."

Upon this letter my father wrote the following memorandum.—" In March the tumour was a hand-breadth lower than it had been in November, or half-way between the anterior spinous process of the ilium and the os pubis.

" Instead of the former clyster, I recommended an infusion of linseed with oil, and to throw in as much as his guts would receive. He found that he could receive a chopin of it, and thought it reached as high as the tumour.

" I prescribed the following mixture:—℞ Mannæ ʒ iij.; Vitel. ovi ʒij.; Olei olivar. ℥ss.; Misce, dein. adde sal. Glauber. ℥j.; Solut. in aq. fontan. ℥ vj.—He took this purgative in the morning, once a-week; at night the clyster, and then the emetic, and passed the clyster in time of the vomiting.

" ' *Dundee*, 2*d April*, 1769.

" ' Upon feeling for the lump yesterday, to my surprise I found it quite away from the lower part of the groin, where it used to give me much pain from every thing that passed it. Ever since, I have suffered great pain across the fundament; and I have passed nothing these two days and nights. I cannot throw up one-sixth part so much of the clyster as I used to do, and that gives me much pain. I am continually very thirsty, have a great pain across my stomach, and the parts there are all extended more than usual. I took physic this morning, but it has not produced any effect. There is a very great rumbling in my stomach; the wind, &c., roll about continually, but do not come lower down. I cannot eat any thing. Pray, let me have your answer in course.

" ' I am, &c., John M. Jun.'

" ' P. S. Since I wrote the other side, I have been seized with a violent vomiting.'

" This gentleman died before my answer reached Dundee, on the 24th of April, 1769.

" After his death a very large concretion was found in the lower part of the sigmoid flexure of the colon."

*Of the mode of cure by a surgical operation.*—There are two different methods by which an extraneous body may be removed from the intestinal canal. By the one the extraneous body is extracted by a pair of large blunt forceps after the rectum has been dilated; by the other, an incision is made into the intestinal canal. It is obvious that the former of these methods is applicable only when the concretion is lodged within the rectum, and a few inches above the sphincter ani. This method of operating was practised successfully by Monro primus. In one case, after the extraction of a large concretion, the patient passed two others. The same operation has been performed with success by Mr. R. Marshall, Mr. Mein, of Dunn, and by Mr. Goodser, of Largs.

*Operation for the extraction of concretions in the alimentary canal by incision.*—There has been some difference of opinion as to the most fit place for making an opening into the intestinal tube. The mode directed by my father, who was the first to recommend this operation, will be found in the following extract :—

" If the concretions shall, by increasing, or by change of place, obstruct and stop the passage entirely, it is, I apprehend possible to save life by taking them out by an operation ; for, as the colon is, on its back part, not covered by the peritoneum, but connected by cellular substance only to the muscles, if an incision be made on the posterior part of it, between the twelfth rib and upper part of the ilium, or immediately above the ilium, *the colon may be opened, without opening into the cavity of the belly ; and the wound, I have little doubt, could be cured without much danger, especially as, in the course of last year, I have seen it in one case wounded by a pistol ball, and in another eroded at this very place ; and yet in both the openings were healed soon.*

" The operation may be performed in the following manner :

" Let an incision be made from the twelfth rib, at the distance of two inches from its point, directly downwards to the top of the os ilium. Then cut slowly, and with great caution, inwards and forwards, till the back of the colon is laid bare for a little way. Then, with one hand, press on the fore part of the tumour, and, with a finger of the other hand, try whether you feel the tumours within the colon. If you think you do, make a very small hole in the colon, and introduce a probe ; and, by that means, make it certain that the balls are there by touching them with it. Then, with the greatest caution, enlarge the incision as much as is necessary for introducing a pair of forceps, such as are used in lithotomy, for laying hold of and extracting them. After they are extracted, and the fæces that may be collected there are pressed out at the wound, let the sides of the incision be pressed together, and let the external part of the incision be stitched, by sutures passed through the skin, at the distance of a finger-breadth from each other. Cover the stitches and incision with straps of adhesive plaster, and with thick pledgets spread with ceratum simplex, and with a compress and bandage, so as to exclude the air."

The proposal of making an artificial opening into the sigmoid flexure of the colon, in order to remove the extraneous body lodged within that bowel, is grounded on the results of the experiments of Mr. Pring, who, in different instances of disease affecting the rectum and obstructing it, has recommended the making an artificial anus in the groin [1].

A third mode of operating by incision has been recommended by Mr. Tortel, viz. the cutting immediately down upon the intestinal concretion, on the supposition that the risk of exposing the peritoneum and intestinal tube has been much exaggerated. But though experiments upon animals—and especially many experiments which were made last winter by my assistant, Mr. Fyfe, have proved—that exposing the bowels, and even removing a portion of them, does not invariably prove fatal, still I apprehend that the method of operating proposed by my father is not fraught with the same extent of danger, as the cutting down immediately upon the concretion lodged within a part of the intestinal tube.

The preceding observations appear to me to have established the following propositions : —1st, That the greater number of concretions found in the human stomach or intestines consist chiefly of fibres of the beard of the oat, which are intimately matted together, and which probably have accumulated round a central nucleus.—2ndly, That they occasion a derangement of the functions of the alimentary canal, and create griping, obstinate and long-continued colicky pains, which are generally limited to that part of the intestinal canal which contains the concretion, and which are occasionally more severe upon the patient taking acids, or food of difficult digestion.—3rdly, That they may be generally felt within the intestines ; and when two or more of these are lodged within the intestines, they may be made to strike against each other.—4thly, That they frequently change their situation, and pass down into the rectum, which is thereby much extended, and, when so situated, occasion acute pain and sense of weight in the back part of the pelvis, with a constant desire to go to stool, which the patient cannot gratify ; and they may, by the finger, or by an instrument passed into the rectum, be felt within it.—5thly, That they are, in some cases, discharged by vomiting, or along with the fæces.—6thly, That an intestinal concretion, after a certain time, cannot be moved from one portion of the alimentary canal to another, owing to its increase in bulk, to the expansion of the coats of that part which contains the concretion into a sac, and to the unnatural constriction immediately below it.—7thly, That they offer a mechanical obstruction to the passage of the aliment through the intestines ; and if proper means be not taken to remove the cause of the obstruction, inflammation of the intestines follows, which proves fatal.—8thly, That, in the earlier stages of the disease, while the concretion may be moved from one part of the intestines to another, all that can be done is, to operate on the bowels, partly through the medium of mechanical action, and partly by lubricating the alimentary canal by the exhibition of proper medicines, in order that the concretion may be discharged along with the fæces, or may descend into the rectum, from which it may be artificially extracted.—9thly, That after the disease has been of long standing, and when a sac has been formed, which retains the concretion in a certain place, it cannot be removed, should it be lodged within the colon, but by an incision, as there is no chance of dissolving it by any medicine given internally.

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[1] Med. Intel. No. 28, p. 61. Feb. 1822.

In conclusion I may remark, that it would be extremely desirable, should any favourable cases occur, to have this operation subjected to a fair test of experiment. Under such circumstances it would be for the operator to reflect how far his success might be promoted by inducing, either by the judicious application of caustic, or other means, such a degree of inflammatory action over the site of the tumour, as might establish adhesion between the two folds (the parietal and intestinal) of the peritoneum, whereby the opening of the bowel might be effected without opening the serous cavity itself.

(*Alexander Monro.*)

AMADOU, see AGARIC.

AMAUROSIS, from ἀμαυρόω, to obscure. *gutta serena, cataracta nigra*, Lat. ; *Schwarzer Staar*, Ger. ; *amaurose*, Fr. ; *gotta serena*, Ital. ; *drop serene, blindness*, Eng.

The derivation of the term does not give an adequate idea of its present acceptation, which refers to affections of the nervous apparatus of vision only, and does not include the diseases of the cornea, lens, &c. which so frequently obscure the sight.

The same objection applies to the terms of more recent introduction, as—Dysopia, from δὺς, bad, difficult ; and ὦψ, the eye (Cullen). Amblyopia, from ἀμβλὺς, obtuse or dull ; and ὦψ, the eye (Savage). The terms considered synonymous in the older writers evidently refer to those forms of the disease which are not attended with any visible change of structure, but in which the pupil remains black and bright ; as—Mydriasis, from μυδάω, to corrupt by moisture (Celsus) ; Gutta serena (Arabian) ; Suffusio nigra ; Black cataract. The term Amaurosis is now employed to denote a diminution or loss of sight, from disturbance or change in some part of the nervous apparatus belonging to, or communicating with, the organ of vision.

It comprehends by far the most important of the ophthalmic affections, or those which most frequently involve loss of sight, which are least understood, and in which medical or surgical aid therefore avails least.

It is only since ophthalmic diseases have been investigated upon scientific principles, that we have begun properly to understand the great variety and importance of the amaurotic affections ; and that their intricacies have been in some degree unravelled, so as to enable us to combat them with more certainty of success. Our knowledge of them is still however far from perfect, although their distinctions are becoming gradually more and more developed under the light of science. There can be no better proof of the prevalent ignorance respecting this class of diseases than the very frequent recommendation and adoption of one particular remedy in nearly all cases, and this even by men who profess and obtain credit for scientific inquiry.

The want of the external symptoms which characterize most of the ophthalmic diseases has perhaps induced and promoted such error in regard to this malady, and tended greatly to impede the scientific investigation of it. Some forms of amaurosis can only be detected and distinguished by a most patient inquiry, aided by experience and science ; for the general symptoms of some different forms of the disease so closely approximate, that a superficial and hasty inquiry cannot suffice to form a correct diagnosis. Error in diagnosis unfortunately involves error in treatment, so as to occasion in many cases loss of sight, which, under correct management, might have been saved or restored.

*Anatomical Division.* — The nervous apparatus destined for visual purposes may be properly divided into three portions.

1. The retina, belonging to the globe itself.
2. The optic nerve, connecting the retina and the brain.
3. The cerebral portion, connected with the optic nerve, and forming part of the cerebral mass or brain.

Amaurosis may result from disturbance in part, parts, or the whole of this apparatus : thus, disease may affect separately the retina, the optic nerve, or the brain, or it may influence the optic nerve and retina together, or it may extend through the three parts at once. From the known principles of nervous power, it must be obvious that any disease affecting the cerebral portion of this nervous apparatus, or the optic nerve, must influence the extreme part of the nerve, or the retina, so that disease cannot exist in either of the former without producing a diminution or destruction of the functions of the latter.

*Pathological Division.*—In considering the pathology of this nervous apparatus, I believe that I cannot adopt a division which offers more practical utility than that suggested by the anatomical arrangement.

First, therefore, I shall treat of such diseases or injuries as affect the retina itself.

Secondly, of such as influence the orbital portion of the optic nerve.

Thirdly, of such as affect the cerebral portion of the nerve.

And lastly, of such as extend through the entire nervous apparatus.

Further, I purpose to separate the diseases in each division into two classes, viz.—those which are not attended with any appreciable change in structure, and are termed functional, and those which are attended with some change, and are called organic.

I consider as functional disease, that which is not accompanied by any change in structure which can be detected, and decided to be the result of a morbid action. Our knowledge, at present, only enables us to determine with any accuracy on such changes in the solid or firm textures of a part or organ; whilst, at the same time, there may exist various morbid conditions of the fluids, especially in respect of superabundance or deficiency, which the most experienced and diligent pathological inquirer cannot determine to be the result of a morbid action, nor distinguish from a change produced during the expiring vitality of the part.

The fluids are, strictly speaking, as much a part of the organization of an organ as the solids, and any morbid condition of them ought properly to be termed organic, as much as if it occurred in the firm texture; but the foregoing explanation of the term functional is that, I believe, most generally accepted, and that which I shall adopt, as facilitating description, and enabling me to give it with more practical utility.

Other distinctions or divisions of amaurosis are, however, recognized, arising from the degree, the extent, the duration, or the cause of the disease, which, though for the most part obvious, I shall nevertheless here point out, that I may be clearly understood in the subsequent use of the various terms.

Amaurosis—is perfect, complete, or entire, when the patient has lost perception of light.

It is imperfect, whilst any degree of vision exists, but the entire field is obscured.

It is incomplete, when a part, or parts, of the field is or are obscured, whilst with the other part or parts the patient enjoys vision.

It is temporary, or intermittent, when the vision is obscured or lost for short periods, but perfect or good in the intervals of the amaurotic attacks.

It is recent, or inveterate, according to the time of its duration.

### Functional Amaurosis—(retina).

*Definition.*—Diminution or loss of vision from affection of the retina only, without any perceptible change in structure.

When the power of the retina is annihilated, the optic nerves, I believe, invariably shrink; and I have known little more than the neurolema to be found, in the extent of the optic nerve from the sclerotic to the optic commissure, in a case of functional amaurosis, originally confined to the retina, and of many years' duration. I have also seen the alteration extend beyond the commissure, but not so far as the quadrigeminal bodies.

*Symptoms.*—Gradual or sudden diminution or loss of vision, affecting the entire field generally; but now and then the field is only partially obscured, or insensible, whilst the other part remains perfect, or obscured in a minor degree.

*Appearances.*—Pupil usually large, round, and fixed, the motive power of the iris being destroyed; sometimes the pupil is irregular, the irregularity corresponding with the unequal sensibility of the retina; occasionally the iris is tremulous; and when the amaurosis is of imperfect character the iris moves sluggishly and perhaps irregularly.

*Prognosis*—depends upon the extent and duration of the mischief. If the disease be recent and imperfect the prognosis is favourable; if imperfect, but of long standing, it is much less so; if recent, or of long standing, but complete, very unfavourable.

*Causes.*—A very common cause of the imperfect disease is non-exercise of the organ, as in a person who squints and uses only one eye; or in a person short-sighted who uses a single glass and always to the same eye; or in those who use frequently a high magnifying power with the same eye, proving that the retina requires exercise to maintain its power as a muscle does.

Secondly,—excess of the ordinary stimulus (light), or its too great brilliancy, affects the healthy retina. Every one is familiar with the dark spectra which result from gazing at the sun for a moment or two, and can easily comprehend how the continued influence of bright light may occasion loss of sight. When the light is very brilliant and unexpected, the functions of the retina may be partially or completely destroyed in a moment; thus the artist who was engaged to take the panoramic view of London from St. Paul's cathedral for the Colosseum, was intently regarding some object by the aid of the camera lucida, when the transit of a dark cloud allowed the brilliant rays of the sun, concentrated by the instrument, to strike unexpectedly on the retina in the axis of vision; the effect was instantaneous palsy of that portion of the retina: it has not recovered its function, but that of the surrounding parts remains perfect. In the same way vivid lightning acts in producing amaurosis. I do not believe that the electric fluid has much if any influence in creating the disease, as I can hardly conceive it possible that such an effect only would result from so powerful an agent; though in a less destructive form I can imagine that electricity might annihilate nervous function.

An ordinary degree of light may so overexcite the retina when in a morbid condition as by degrees to destroy its function and occasion amaurosis; thus it is, in severe cases of scrofulous ophthalmia of long continuance, and attended at first with great intolerance of light (photophobia). I have known patients become amaurotic without any perceptible organic change, and in which I could not attribute the loss of vision to other causes than diminution or destruction of the power of the retina from long-continued over excitement, in the manner above-mentioned.

Thirdly,—Concussion from a shock which does not produce any perceptible organic lesion, is a frequent cause of partial or complete amaurosis. When the eye is unprepared for violence, a very slight blow will destroy the functions of the retina, but if the violence be expected, it will sustain a violent concussion without serious injury. The following is a most remarkable case of amaurosis of this kind: A young man was amusing himself by looking at some gentlemen who were shooting at pigeons from a trap, and was situated at a distance of about two hundred yards from the shooter. Immediately after a shot he was sensible of a slight blow on the outer part of one eye, which produced a slight stinging pain of momentary duration only; some confusion in vision induced him to examine the state of both eyes, and he found that he could not even perceive light with that which had been struck. On the following day he applied at the Infirmary, when I found the pupil dilated, the iris motionless, and a small ecchymose spot, about the size of a large pin's head, between the outer margin of the cornea and the external canthus; there was not any lesion of the conjunctiva or sclerotica, but merely a slight extravasation between the two; vision was completely destroyed, and he remained amaurotic, in spite of all treatment, which was carefully pursued for many weeks.

I have seen two cases of amaurosis from blows inflicted with the end of a whip lash: in one instance the sufferer was seated at the back of a stage-coach outside; and in the other the patient was driving in a gig, and passing a stage-coach, at the time he was struck. In neither case was there lesion of membrane, but slight ecchymosis and subsequent ophthalmia; one remained amaurotic, and the other recovered perfectly; but, in the latter case, the amaurosis was incomplete from the first. The more severe cases of this kind, attended with organic lesion, will be considered under the next head.

Fourthly,—Some of the narcotics appear to exert a particular influence on the functions of the retina, especially the belladonna, and those which possess somewhat similar medicinal properties. Many years since I applied the extract of belladonna very freely to allay the irritation and pain of surfaces exposed by malignant ulceration. In one case the disease existed in the cervix uteri and vagina; and, in a second case, it had attacked the rectum. The effect of the application was in both instances similar; it allayed greatly the local suffering, but produced a temporary amaurosis, with enormously dilated state of the pupils. I repeated the application after several days, when the amaurosis had disappeared, and with like result.

Several other poisons—animal, and mineral, as well as vegetable—affect vision; but at the same time disturb the functions of the stomach, or heart, or brain, &c.

*Treatment.*—When the amaurosis of imperfect character has arisen for want of due exercise of the organ, the obvious remedy is to give it the proper degree of exercise to restore the lost power; and this is in fact the only means of exciting the retina to its natural degree of activity. It is, I consider, best done gradually, to prevent the risk of any congestion likely to result from the constant use of a weak organ. Thus let the patient use the weak eye for half an hour on small objects, two or three times in a day, then for an hour, and so on, gradually increasing the period of exercise until the eye can be used for hours together without much inconvenience. Whilst the weak eye is in use, the perfect one must be closed or obscured. It requires much perseverance to effect a cure in most of these cases, even in such as are of recent origin. When the patient has lost the power of discerning large print, or when the affection has been of several years' duration, more especially if it be in an adult, I do not think that much good is likely to be effected by this plan; but when the patient retains the perception of large print, I believe that perfect vision may be restored. Little or no good can be effected by any other local or general means.

Amaurosis, resulting from the influence of too much or too brilliant a light on the retina itself, is generally of sudden occurrence, is most frequently perfect, and usually affects the entire field of vision, though, as in the case of the artist, it may be partial or affect only one portion of the retina. The cases of amaurosis of slow progress, usually supposed to result from the influence of too much light upon the retina, are produced from the congestive condition of the choroid, and the effect on the functions of the retina is secondary: this form will be considered with the organic retinal diseases.

The effect, then, of too brilliant light on the retina is very similar to the effect of concussion, not only in its immediate, but remote consequences, and requires a similar plan of treatment.

Before describing this, I have only to observe that the mischief likely to result from the effect of moderate light on the retina morbidly sensible, is easily avoided by excluding the light until the extreme sensibility has been subdued.

The immediate effect of a blow or concussion, as well as that of a too brilliant light upon the retina, is sudden, and may destroy either the function of a part or of the whole, or the function may be only impaired; the remote effect of either is inflammatory action. In these cases, when the function of a part or the whole is entirely and immediately lost, I believe that it is not to be ever restored, for I have seen very many such cases, and have adopted careful and continued treatment without any good effect. When the amaurosis is incomplete, the function of the retina in general gradually returns if the medical attendant prevents any destructive inflammatory action, and this is to be done by rest, local bleeding, quiet, moderate or abstemious diet, and purgatives; or when these are not effective, the use of mercury, or counter irritation by blisters over the eyebrow aids much. I think more good results from repeated blisters than from one kept open for some time. After all inflammation has been subdued, electricity or galvanism assists in expediting the recovery of the nervous power; strychnine might do the same, but I believe such cases would recover equally well, though not quite so rapidly, if left alone.

Disturbance of the functions of the retina, from the influence of narcotics, which does not create any other injurious effect, subsides on removing the cause, or withdrawing the use of the narcotic. When the amaurosis is accompanied with other morbid affections of stomach, head, &c. the case requires care and attention, and a mode of treatment, the explanation of which lies beyond my present limits.

There is a functional form of amaurosis resulting from congestion of the choroid coat of very common occurrence, and which, though temporary, often leads to permanent organic disease in this tunic, and produces perfect amaurosis: it will be described with chronic choroiditis.

### ORGANIC AMAUROSIS—(RETINA).

*Definition.*—Diminution or loss of vision from alteration in structure, usually manifest on examination of the organ and affecting the retina.

A very large portion of the amaurotic cases come under this head, as it embraces all the morbid changes which take place in the retina or choroid singly, or in combination with disease of other tunics or humours of the globe, and which I shall treat of in the following order, giving however a minute description of those changes only, which I consider properly belonging to the subject of this paper.

1st, Inflammation of the retina, acute and chronic. 2d, Inflammation of the choroid, acute and chronic. 3rd, Inflammation of the globe generally. 4th, Lesions of the globe. 5th, Scrofulous and malignant disease of the retina.

The more scientific arrangement of the subjects would perhaps have been that which first offered explanation of the morbid changes affecting the retina itself immediately, and subsequently of those diseases which affect the retina secondarily; but the order which I have adopted will I think be of greater practical utility in more directly contrasting the two most important diseases, viz. retinitis and choroiditis.

### INFLAMMATION OF THE RETINA—(ACUTE).

*Synonyme—Retinitis.*

*Symptoms.*—Sudden occurrence of severe pain; throbbing and darting, principally at first in the globe, but the darting extending to the brain, and coming on in paroxysms; great sense of fulness and tension of the globe, with excessive tenderness; much intolerance of light at first, with frequent flashes of vivid reddish, or orange-coloured light, or frequent scintillation, even when all daylight is excluded, and more especially at night, or when the patient assumes the recumbent posture; the suffering increased by sudden movement of the globe, which also produces flashings or sparks. At first sometimes a paucity of secretion, or an excess of it, which is hot or scalding.

In a short time from the commencement of the attack the vision becomes dull and cloudy, and the denseness of the cloud increases rapidly until the perception of the natural light is lost, whilst, however, the appearances of light clouds, flashes, and sparks continue. In the early stage of the disease objects appear occasionally tinged with red or deep orange colour, as now and then occurs on our summer or autumnal evenings. The pain soon extends from the globe to the orbit and its circumference, being particularly severe at the supra-orbital notch; it is of remittent character: the attacks are most frequent in the evening, or early in the morning, often affecting the cranium and face on the affected side, producing severe hemicrania, with great tenderness, so that the patient cannot bear a nightcap, or covering on the part; the patient complains of the sensation of grit, or some foreign particle in the eye from the beginning of the attack.

When the disease has perfectly destroyed the vision, the suffering ceases suddenly or gradually.

*Appearances.*—The eyelids are usually closed, and often a little tumid and red; spasmodic action occurs in the orbicularis muscle on exposure to light, unless the vision be quite destroyed; I have, indeed, often observed the patients shrink from and complain of bright light, though they could not tell the direction of the rays, or their intensity. Lacrymation is abundant in most cases, and increased by exposure or examination of the eye. The conjunctiva exhibits several large and tortuous vessels, distended with purple-coloured blood, and passing from the direction of the attachments of the recti muscles towards the cornea, diminishing in size, but dividing and subdividing, and anastomosing, as they approach the corneal margin, beneath and in the spaces between the conjunctival vessels. Some of those of the sclerotica may be seen injected with blood of a lighter colour, but not so brilliant as that in the conjunctiva,—they are straight and small.

The iris is dull and discoloured, or looks dirty, the pupil is at first contracted, but soon becomes dilated and irregular, being oblong,—usually in a direction upwards and inwards; sometimes upwards, now and then horizontally elongated, and rarely downwards. The iris is motionless or nearly so. The blackness and brightness of the pupil is lost, and it has a dull and usually greenish aspect, with the appearance of an opake spot, as that seen in the onyx, but of a greenish hue, and which (as the spot in the onyx) varies its position according to the angle of incidence of the light; it has, perhaps, more resemblance to the reflection of the sun from a turbid and greenish stagnant pool. When this appearance is distinct, the term Glaucoma is applied to the disease, from γλαυκὸς, sea-green.

The feel of the globe is hard and inelastic.

In the last stage of the disease, the general redness diminishes in the conjunctiva and sclerotica, but the principal vessels of the former become larger, more tortuous, and of darker colour; the pupil becomes more dilated and fixed; the opacity of the humours increases, and complete *lenticular cataract* is formed, which has, however, nearly always some green tinge.

These changes are effected sometimes in forty-eight hours, and but seldom require more than four or five days for their completion.

*General Symptoms.*—Retinitis I believe always to be a consequence of some material derangement of the general or constitutional power, under which the balance of the circulation is easily disturbed; thus, in the history of these cases, it is usually found that the patient has been complaining, or has been observed, by those immediately about him, to have been unwell for some time previous to the burst of retinal inflammation. These general symptoms, however, become more manifest when the local disease is developed, and new symptoms present themselves as consequences of the retinitis.

Previously to the attack, there is generally lowness of spirits, despondency, loss of appetite, irregular state of bowels, disturbed sleep, or unusual heaviness and torpor, with headache; a loaded tongue, clammy mouth, and sometimes feeling of nausea; the extremities are cold, and there is a disinclination to mental or bodily exercise. The severity of the local disease rouses the system; the patient becomes restless and watchful; the surface and extremities are unusually hot and dry; the face flushed; the pulse is quick and sharp,—in some patients, hard and wiry, in others easily compressible; the tongue is more loaded, the mouth parched, and nausea, with much thirst, is experienced. The local and general symptoms are aggravated by the recumbent posture.

*Prognosis* is always unfavourable; in the majority of instances the disease makes such rapid progress, that the surgeon has not time to apply remedies to arrest its disorganizing effects; and in those cases in which he has opportunity to use his remedies, and even succeeds in arresting the disease so as to preserve a useful degree of vision, the patient is subject to relapse from such trivial causes that he seldom retains vision for more than a few months, but fresh attacks of inflammation complete the organic change, and destroy the functions of the retina.

The disease which I have described is rarely met with in persons under the middle period of life; is most frequent between the ages of forty-five and sixty, though often seen in persons of more advanced age. It is more common in females than in males, and is almost confined to persons having dark irides. I have, however, seen exceptions. It attacks sometimes one eye first, but more frequently both together, though not to the same extent; or it runs through its course with greater rapidity in one eye than in the other. When it appears only in one eye it will most probably appear in the other, unless the greatest caution be used. I have seen this disease most frequently in persons of sanguine temperament, with dark complexions and spare figures; or in those who have a large and soft frame, with indolent circulation, but much nervous irritability.

*Causes.*—The predisposing causes of this affection, are such as derange any of the more important functions, and tend to disturb or destroy the balance of the circulation, and of nervous power; but especially such as at the same time depress or exhaust general power.

Excess of mental labour, or mental anxiety alone, are sufficient to produce the effect; but they are particularly prone to do so when operating on a system in which disturbance has been already excited, as during a change in, or arrest of, uterine action; or from the arrest of long-standing morbid discharge from a natural secreting surface upon a sore; or, further, in consequence of the cessation of frequent and habitual hæmorrhage, either uterine, hæmorrhoidal, or nasal. Again, during suppressed gout. The exciting causes are over exertion of the organ, the influence of bright light, exposure to cold and damp; but I have often known the disease commence without being able to detect any particular cause as immediately inducing it. I have seen a few instances in which slight injury has called forth the morbid action.

The most rapidly destructive and distressing cases that I have witnessed have occurred during great mental anxiety and distress; as in the elderly female from loss of husband or child; and in the male from sudden loss of property and comfort, in consequence of imprudent speculations, or from the deceit of one previously esteemed and valued.

*Treatment.*—Although acute retinitis occasions such rapid disorganization, (by implicating other textures,) and annihilates the function of the organ in many cases; yet in some, the disease may be checked, and some useful degree of vision preserved for months, or perhaps years; and when only one eye is attacked, the fate of the second, I believe, much depends upon careful management.

The first object of treatment is to arrest the disorganizing action, and lessen or relieve suffering; the most powerful and proper agents to effect this are bleeding, mercury, and narcotics; but much judgment and care are necessary in their employment, or more evil than good will result, from the two former especially.

The force of general vascular action is, in these cases, usually below par, and general abstraction of blood is therefore not only unnecessary, but even likely to prove injurious; it should never be resorted to whilst the pulse is easily compressible,—only when it is hard and incompressible; and then very cautiously. Even local bleeding, by cupping-glass or leeches, must be cautiously employed when the circulation is depressed and feeble, or its effects may be injurious instead of beneficial. Unfortunately, the loss of blood, generally or locally, often mitigates suffering for a time, and therefore induces the patient to solicit the repetition of it; and, too often, the medical attendant, ignorant of its baneful tendency, follows up the deceptive plan of treatment. The disease cannot be arrested or cured by loss of blood; the only good, in my opinion, which can be effected by it is lessening tension of vessels, so as to retard the disorganizing process, and allow time for the operation of other remedies. I should only, therefore, abstract blood generally when the pulse is hard and incompressible, and then only in sufficient quantity to relieve the tension of the vessels; but, otherwise, I should prefer the use of leeches upon the palpebræ, as affording the means of emptying more readily the vessels of the affected part; and in particular cases, where the leech acts injuriously, I should apply the cupping-glass to the temple or behind the ear; to the former spot if no hemicrania existed,—to the latter if there were any cranial pain or tenderness.

Mercury I consider to be a more powerful and serviceable agent in this disease than bleeding, when properly employed; and equally dangerous as bleeding when used indiscriminately. It may be first given with some drastic purgative, followed by an alkaline saline aperient to carry off all the matter accumulated in the intestinal canal, and afterwards administered with a narcotic in a form, dose, and with a frequency adapted to the condition and ordinary character of the mucous membrane, and also to the power of the patient: at the same time general power must be maintained by a simple nutritious plain diet and stimulus, according to the previous habits of the patient; for those much addicted to stimulating drinks are rarely able to combat disease, if altogether deprived of that which they have become habituated to.

It is generally considered necessary in the treatment of this disease to follow up what is called the antiphlogistic plan of treatment in its strictest sense: and this, I am satisfied, is the most injudicious course that can be pursued; for where it may do good in one case, it will do mischief in at least a dozen.

The first object of treatment is, then, effected principally by local bleeding, by acting on the more important secretions, and by mild mercurial influence: but, further, local aids may be applied to allay suffering and retard the diseased action; first, by narcotic fomentations, ointments, and plasters; secondly, by counter-irritation: thus the eye may be exposed to the vapour of boiling water in which some narcotic has been mixed, or warm flannel or linen, sprinkled with laudanum or wine of opium, may be frequently applied to the surface of the lids. The use of much moisture, although it relieves at the time, occasions aggravation of suffering afterwards; and similar effects result from the employment of cold. Gentle friction, with a narcotic ointment over the supercilium and to the temple, I have found very serviceable in subduing local pain; and I have frequently combined the narcotic with the blue ointment, with excellent effect, in cases in which the internal use of mercury was objectionable, from irritable state of bowels. In other instances, when the ointments have failed to relieve, I have obtained the desired effect by covering the forehead and temple with a plaster made of soap cerate, opium, and belladonna. The application of blisters to the neck, or behind the ears, often proves very beneficial; I prefer the repetition of them, to the keeping up a discharge by stimulating means.

The second object of treatment is to subdue the local diseased action, and restore the balance of circulation and nervous power.

This is to be effected by a careful continuance of the local and general medicinal means described; aided by a regular, plain, and nutritious diet, moderate exercise, warm clothing, perfect rest of the organ, and, as far as possible, mental relaxation and quietude.

When once fairly checked, the inflammatory action rapidly subsides under the above treatment; and as the symptoms of severe character disappear, the various remedies appropriated to them may be laid aside; thus the local applications may be abandoned when the local pains are subdued, and the mercurial may be diminished, as the vascular turgescence lessens.

When all appearance of diseased action is gone, there is often much to do to place the patient in a state of safety, and unless this be done, the medical man ill performs his duty to his patient.

There is liability to relapse or to the occurrence of fresh inflammation from trivial causes, so long as the circulation is of feeble nature, and the balance of vascular action or nervous power unequal.

The patient should therefore be kept under surveillance, and made to continue a regular plan of diet and exercise, such as will tend to increase and maintain general power, and at the same time adopt a very mild alterative medical course to correct error in secretion, and improve the condition of the circulation. All mental excitement should be most carefully avoided.

Any return of uneasiness and appearance of congestion in the affected organ, should be immediately met by the application of a mustard plaster or a small blister, and a weak stimulating lotion of acetate or sulphate of zinc may be used once a day to promote contraction of the distended conjunctival vessels, as a few usually remain, after active disease has ceased.

If possible the patient should be placed in a pure air, till his health and strength are renovated.

### INFLAMMATION OF THE RETINA—(CHRONIC).

*Synonyme—Retinitis.*

*Symptoms.*—This disease commences either with slight dimness of vision accompanied with occasional scintillations or flashings of light; or the appearance of flashings, &c., is the first indication of diseased action, and is quickly followed by a diminution of visual power. The entire field of vision appears dull or misty; and the patient seeks a bright light, by which the sight is somewhat improved. Often from the commencement a dull pain is experienced at the brow, corresponding particularly to the site of the supra-orbital notch; usually the pain is remittent, being severe only for short periods; or it is sometimes intermittent, though not with any regularity; it frequently extends to the forehead, temple, and cheek. These symptoms augment by degrees; the vision becomes more obscured, the pain more frequent and severe, as well as extended, and the luminous appearances occur in greater variety and number; there is, however, much difference in the amount of pain and in the degree of flashing, &c. in different cases. I have observed that they are usually proportioned to the progress of the disease, being trifling when it is slow, and more urgent as it is rapid. I have known the disease pass through all its stages to the destruction of vision without any pain, but never without some scintillations or luminous appearances. These appearances present almost endless variety in different patients; from a single small spark, to the most vivid and brilliant coruscations or flashings; sometimes there is a semblance of fire-works, sometimes bright circles of unequal brilliancy, fixed or in motion, and occasionally spreading out and vanishing, as the circles created by the falling of a stone on the surface of a smooth pool; at other times the figures are oblong or square. Whatever may be their figure they are seldom very troublesome in the early stage of the disease; but often continue even for years after the amaurosis is complete.

In the early stage of the disease the power of adapting the eye to near and distant objects is sometimes diminished or lost, so that an object seen with tolerable distinctness in one position, becomes indistinct or lost if its relative distance be changed. I do not, however, consider this to be the result of retinal affection, as I shall hereafter describe. More frequently objects appear distorted (*visus diffiguratus*) especially those which present much length or height with little breadth; they seem bent or broken.

The symptoms are aggravated by whatever disturbs the circulation suddenly, as a change from the erect to the recumbent posture, fright, or any sudden mental emotion; or whatever effects this change in the vascular system more slowly, and depresses power, as continued mental labour or anxiety, exposure to damp and cold, derangement of digestive organs, exhausting exercise; they are also augmented by too much exercise of the organ itself.

The symptoms are mitigated by whatever tranquillizes the circulation and promotes its power gradually and tends to maintain it in equal balance; thus vision improves, pain subsides, &c. from a few hours' quiet repose, and a similar effect results from a moderate nutritious meal.

Whilst power of vision remains, it is always improved by a bright sun-light; though the ordinary artificial light is of little or no assistance.

The sensation of some fine particle or particles of foreign matter being in the eye, is also a common symptom in chronic retinitis, and sometimes the globe feels full and tender.

*Appearances.*—The first deviation from the ordinary condition of the different structures of which the organ is composed, is to be perceived in the pupil, which loses its circular figure and becomes oblong (very slightly so at first), and is generally elongated upwards and inwards in a direction towards the trochlea of the superior oblique muscle, but the direction of the elongation varies as I have described in the acute disease; the alteration is upwards and inwards, in at least nineteen cases out of twenty; and in whatever direction it occurs, there is always a general dilation, but at first also very trivial, and the motions of the iris are rather sluggish. By degrees the pupil becomes more dilated, more irregular in figure, and the motions of the iris more difficult; the space of the pupil loses its blackness, and assumes a dirty grey or green appearance, which exhibits unequal density, there being usually a spot more opaque than the other parts, and which resembles the commencement of cataract, for which it is often mistaken: the distinction is however simple. The cataractous opacity is in the lens, and occupies its central part in ordinary cases, and maintains this relative position whatever may be the incidence of the light, or whatever may be the position in which the pupil is regarded. The opacity consequent upon chronic retinitis, (when in the degree I have described) always changes its position according to the incidence of the light, so that it appears central (as the cataractous opacity) when the light falls direct upon the pupil; but if the light falls from the nasal side of the cornea, the opacity of retinitis appears on the temporal side of the pupil; if the rays are incident from the temporal side, the opacity is seen in the nasal part of the pupil: it is always on the side remote from the origin of the incident rays, and can be made therefore to shift its position, by changing that of the patient, or by movement of the eye itself; it resembles the reflection of the sun or any other luminous body from a muddy pool. Besides its change of position from altered incidence of light, the opacity here described is distinguishable from its not appearing so near the surface as that which takes place in the lens.

As the disease advances, this turbidity of humour increases; the opaque spot becomes more dense, and assumes a more decided green tinge, from which the disease now obtains the name of Glaucoma. The iris now loses its brilliancy, and sometimes alters slightly in colour; and some distended tortuous vessels appear in the conjunctiva of a dark red or purple colour, and passing from the recti muscles to the cornea.

Lastly, the lens actually becomes opake and cataract exists, but almost invariably it has a greenish tinge: I have seen it of the deep green colour of the sea, and in a very few cases of a dirty yellow colour. This is in the last stage, when the pupil is extremely dilated and fixed. The distended or varicose vessels of the conjunctiva are numerous; the globe is hard and inelastic, and appears more prominent than natural.

This disease, unchecked, usually proceeds through its different stages in the course of a few months, sometimes in only a few weeks; but under careful management I have seen it retarded for years, so as to preserve some useful vision, but this can be accomplished only in very few cases.

The disturbance of the function of the retina is not at all in proportion to the visible organic change, for useful vision is generally lost before there is much change apparent in the vitreous body, or before the change is sufficient to account for the diminution of function in the retina.

The history of this disease affords a very beautiful illustration of the extension of morbid action by vascular connection.

First, disturbances evinced in the retina by flashings, sparks, &c., by diminution of vision, and further by the direction of pain in the acute cases, and the sympathetic pains in both forms.

Secondly, the vitreous body becomes turbid; and, lastly, the lens loses its transparency, and cataract forms.

Thus, after morbid action has been fairly set up in the retina, as supplied by the primary divisions of the central artery, the vitreous body, as the next part supplied by the continuation of this arterial distribution, soon participates in the disease; and subsequently the crystalline lens, organized by the extreme division of the same vessel, becomes affected, and undergoes some such morbid change as the retina and vitreous body have previously undergone.

The changes in the vitreous body and lens are apparent during the progress of the disease, and in a great measure prevent us from observing the condition of the retina. From examination of this structure after death, in persons who have suffered from glaucoma, it is stated by some, that no morbid change can be detected; this I think probable, inasmuch as exceedingly slight change may take place, which our imperfect acquaintance with the healthy state of the membrane will not enable us to recognise; and further, so rapid is the change in this part after death, that a few hours occasion a great difference in its appearance. I conceive that the examination should be made very shortly after death, and by a very experienced pathologist and anatomist, in order to detect any diseased condition.

*General symptoms*—consist in derangement of some important function, with an unequal balance of circulation and nervous power; these are, however, causes rather than effects, and co-existent with the development of the disease.

Chronic retinitis, in the acute form, is a disease confined to persons advanced in life, is more frequent in females than in males, and attacks very rarely the eye with a light-coloured iris. It very seldom commences in both eyes simultaneously, though it seldom exists for many weeks or months in one eye, without the other becoming affected; but I have seen it disorganize one eye, whilst the other remained sound.

*Causes*,—both predisposing and direct, are the same as in the acute form of disease, with the exception of violence, which however sometimes converts the slow or chronic affection into the acute; and this indeed takes place from other causes, as cold, damp, over-exertion, &c.

The attacks thus excited are frequently not very violent, and are easily subdued, but they materially hasten the loss of function of the retina, and when once stirred up, are prone to reappear until the perception of light be lost.

In persons of gouty diathesis, who have experienced for some years several attacks annually of arthritic inflammation, but in whom such attacks are suddenly suppressed, and in those who have for years been subject to continued or periodical discharges or hæmorrhages which become unexpectedly arrested, the first stage of glaucomatous disease frequently occurs, without producing disorganizing effects; and a return of the previous affection is sometimes followed very speedily by a disappearance or great diminution of the ocular disease; so that the patient again enjoys useful or good vision.

*Treatment.*—The first endeavour should be to do away with the exciting cause, as over use or exposure of the organ, and then, if possible, to subdue the predisposing cause; this latter, I regret to say, is too often beyond the reach of our limited science and art, being mental in so many instances; but although we cannot subdue, we may mitigate the unfavourable state which promotes the progress of the local disease.

First, then, the patient should be taken from employment which requires much ocular or mental exertion, and be guarded from exposure to bright lights, or from the influence of sudden atmospheric changes; and by degrees, perhaps, he may be induced to engage in some business or employment which may amuse, but not fatigue; and serve to occupy the mind, sufficiently to exclude distressing thoughts.

Dietetic and medicinal means should be employed to correct error in any great or principal function, and at the same time to support strength, and equalize vascular and nervous power.

Persons subject to this disease but very rarely require depleting measures; as it nearly always arises under a depressed and irregular condition of circulation. If there are symptoms sufficient to warrant the loss of blood generally, it should be abstracted with great caution and sparingly.

The general plan of treatment that I have described as necessary for subduing the acute form of the disease, is that best adapted to arrest, and perhaps, in a degree, subdue the chronic affection.

The local symptoms of fulness or pain are best remedied by counter-irritation, viz.: mustard plasters, not to vesicate; blisters repeated; or tartar-emetic ointment applied as a small plaster: these all act most beneficially when applied over the expansion of the supra-orbital vessels and nerves. In cases where there is much ocular congestion or cerebral fulness with flushing and heat of head, a few leeches may be applied to the palpebræ, or a single cupping-glass behind the ear; but blood must not be removed to such an extent as to affect the general power, or it will inevitably prove injurious.

The observations previously made on clothing and exercise, in the treatment of the acute disease, apply equally in that of the chronic.

There are two other diseases which affect the retina and by occasioning organic change produce amaurosis.

One was, I believe, first noticed and described by Beer, and named by him the cat's eye, from its being characterized by a brilliant metallic lustre, like that observable in the eyes of the cat and other animals of the same kind, in particular positions, or under certain modifications of light.

This disease is extremely rare; the few examples that I have seen of it, have been in males. The first case which came under my observation was in a boy about ten years of age, of healthy aspect and make: his parents stated that he was blind, that he had been so for some time, and that the loss of vision had been gradual. He had a somewhat vacant countenance, which was the only circumstance that indicated his loss of vision; for when I examined his eyes by the aid of a strong light, I could not detect any change in texture or function which could account for amaurosis; the humours appeared perfectly clear, the iris healthy, most active in its motions, and obedient to the influence of light. From these circumstances I suspected that the boy was feigning blindness, but kept my suspicion to myself, and ordered some simple medicine; he was brought two or three times to me before I detected the nature of the complaint, and this I did accidentally. He was standing a few feet from me, among some other patients, in a situation shaded from the bright light admitted by the window, when I observed a brilliant metallic reflection from the pupils of his eyes, such as would take place from a cat's eyes similarly placed: upon his being brought into a clear bright light this appearance could no longer be discerned; but when he was again placed in a shaded part of the room, at a distance of a few feet from me, it became again evident. When the pupils were dilated by belladonna, scarcely any morbid appearance could be seen, so long as the eye was exposed to a clear bright light; but the metallic reflection was brilliant, and readily perceived in a moderate light at a short distance, whilst, on close inspection, it always disappeared.

The patient attended for several months at the infirmary, and mild alterative treatment was adopted but without any advantage, or any increase of morbid appearance.

In another case also, which I had an opportunity of watching for some months, no perceptible change took place; and in all the cases of this kind that I have seen, the amaurosis has been complete.

I am disposed to consider this disease as occurring in the choroid, or between it and the retina, from the close resemblance of the metallic reflection to that seen in the feline tribe, in which we know the appearance to result from the tapetum; and further, because I believe that a morbid change in the retina which could give rise to such an appearance, would be easily detected under a close inspection in a bright light, especially when the pupil is dilated.

As to the other disease, we are satisfied, by anatomical investigation, that it is seated in the retina. It presents at first either of two different appearances—sometimes a bright yellow colour pervades the entire pupil, and on close inspection (the pupil being dilated) a uniform opake yellow deposit can be easily discerned in the site of the retina; but in other cases, the yellow appearance in the pupil is partial, and when the pupil is dilated part of the surface of the retina exhibits opake yellow tubercles, whilst in other parts its usual dark and brilliant appearance is retained. The yellow deposit, whether uniform or tubercular, presents usually a few or numerous red vessels, carrying red particles of blood. When it is entire and uniform the patient is completely amaurotic, but when tubercular and partial, the portions of the retina not occupied by the deposit retain the usual degree of sensibility; this lasts, however, only for a short period, for the disease soon extends over the whole surface of the membrane.

Either appearance is usually regarded as the commencement of malignant fungoid disease; but I believe that such an opinion is erroneous, it being in many instances a merely scrofulous deposit: my principal reason for expressing this belief is, that I have known several of these cases to terminate in atrophy of the globe, under the most careful management.

As the treatment of this disease, however, is not adopted with a view to cure the amaurosis, which I believe to be inevitable, I cannot here enter into it.

This disease most frequently appears in infancy, very rarely in adult persons: it is distinguishable from the cat's eye, in being apparent in almost any degree of light.

In the eyes of old persons, the pupils have sometimes a greyish or silvery appearance, somewhat approaching the cat's eye; this results from a deficiency of pigment, which can be detected when the pupils are dilated, and which is attended with a diminution of the power of vision.

### INFLAMMATION OF THE CHOROID—(ACUTE).

*Synonyme—Choroiditis.*

*Symptoms.*—Pain deep-seated, dull, throbbing, with occasional shooting, and sense of fulness or tension of the globe; vision disturbed, the field being obscured by grey or black spots (muscæ), or by a dark net-work or gauze, or by clouds, as of mist. Usually at first the disturbance is unequal, one part of the field being obscured more than another, and most frequently the obscurity is greatest at the inferior part; there is also some tenderness of the globe; often dull circumorbital pain of remittent character, and head-ache, or sense of weight at the forehead.

The symptoms increase rapidly, and vision is soon destroyed.

*Appearances.*—The eye appears partially red or inflamed, and the redness is dull and of a brick-dust colour; a close inspection shows that it results from many of the small straight vessels of the sclerotica being distended with red blood; they pass from the margin of the cornea towards the orbital margin, being most abundant near the cornea: the injection of these vessels is usually partial,—perhaps one-half of the portion of the sclerotica exposed may exhibit them, whilst the other part retains its ordinary character; or, if the whole visible surface be red, one part is more deep in colour than another; a few tortuous vessels of the conjunctiva, slightly distended with red blood, are also often visible, and may be easily traced as superjacent to those of the sclerotica, over which they may be made to move by pressing the membrane.

The iris soon becomes dull, the pupil contracted, and its margin slightly irregular; and by degrees this membrane grows discoloured, and a thickening, with more irregularity, occurs at its inner border, which becomes attached, by points, to the anterior capsule of the crystalline lens (synechia posterior). Lastly, the capsule of the lens becomes opake, or covered by a deposition of opake fibrin.

The sclerotic coat in very severe or protracted cases, now and then gives way near to the corneal circumference, and is protruded outwards (forming staphyloma scleroticæ); it is evidently thinned, and appears bluish or brown-coloured, from the subjacent varicose choroidal vessels or the pigment being partly apparent through it: the globe feels hard and tense.

This disease is confined very much to those who are of scrofulous diathesis and naturally of feeble power; it occurs in children, (I have seen it in infants,) and in adults below the middle period of life; very rarely indeed in elderly persons.

*Causes.*—Over-exertion of the eyes, or exposure to bright light, or to cold and damp. It rarely commences in the acute form, without some warning of congestive, or subacute character, which sometimes occur weeks or months before the acute disease bursts forth.

*Prognosis*—is favourable, if the retina be sensible of the influence of light, and there be no organic change affecting the capsule of the lens, or the sclerotic; and even when the capsule of the lens has become opake, without alteration in the sclerotic, vision may often be restored by medical and surgical means combined. Much depends also upon the duration of the affection: the prospect of recovery diminishing in proportion to the lengthened continuance of the disease and its effects.

*Treatment.*—The acute form is easily checked by local abstraction of blood by leeches or cupping, and by acting rather freely upon the secretions; but these remedies should be carefully adapted to the age and strength of the patient. I cannot, however, satisfactorily enter into the full consideration or explanation of treatment, without a description of the chronic form of the disease, which I shall therefore previously give.

### INFLAMMATION OF THE CHOROID—(CHRONIC).

*Synonyme—Choroiditis.*

*Symptoms.*—More or less functional disturbance usually precedes the inflammatory action of subacute kind in the choroid tunic; and sometimes this disturbance continues for months or years without inflammatory action supervening. The great variations in the degree of disturbance, and the occasional or frequent entire subsidence of the symptoms, evince the functional character of the disorder. The most common derangement of this kind consists in the appearance of one or two or numerous grey or black spots or figures in the field of vision (muscæ), which present endless varieties, in figure, size and number, and occupy different positions in the field; most frequently they seem to move (volitantes,) especially on any sudden motion of the eye; thus, if the eye be suddenly directed upwards, and fixed for a short time in that direction, the spot or spots appear to ascend, and then gradually to descend, as if falling. Sometimes the muscæ are fixed, and occupy always the same relative position in the field of vision. On their first appearance, these muscæ are faint and evanescent, and of small size and number,—but by degrees, they increase in density, in size, and in number, and the forms vary and extend; they also become apparent for longer periods, until at last some become permanent. They are most readily discerned on a light and bright ground, or when the patient looks at white paper, a white wall, a light cloud, &c.; but they are not visible if the eye be directed to a black or very dark ground; as to a black paling, a black or dark dress, &c. On making an effort to fix them on a light ground, they sometimes enlarge, or fresh ones appear; but the previous state is resumed as soon as the effort ceases. I often regret that I have not preserved the numerous diagrams of these appearances which have been brought to me at different times by patients. They would have formed a curious collection; and demonstrated the infinite varieties of figure assumed by these ophthalmic muscæ.

Again, the function of the retina is very often disturbed in the following manner:—After the eyes have been engaged for some time on minute objects, the patient experiences a degree of confusion,—the objects becoming partly or wholly obscured by a network, or mist; but, after resting the eyes for a few moments, and rubbing or pressing them slightly, the vision again becomes distinct; this occurs again and again; the disturbance is excited more readily and more rapidly the more the vision is exerted, and a longer period of rest is required for the subsidence of the effect.

After some time any attempt to view minute objects reinduces the obscurity, and, eventually, the vision remains cloudy or dull, as if a piece of gauze, or a thick veil intervened between the eye and the objects regarded. This disturbance is frequently preceded or accompanied by muscæ, and is usually attended by a sense of fulness in the organs, and a weight or uneasiness about the forehead.

Whilst the sight remains good for all ordinary purposes, requiring but little exertion of the eyes, the term *impaired vision* is employed to denote this affection, at the London Ophthalmic Hospital, to distinguish it from the condition of constant imperfection in the more confirmed amaurotic disease.

Usually some degree or form of the functional disturbances which I have described precedes organic change in the choroid, although sometimes to a very trivial extent.

The commencement of organic change is indicated by some of the above-described symptoms becoming permanent,—as permanent and fixed muscæ, or a continual appearance of network or cloud which obscures vision. This network or cloud does not, however, always occupy the entire field of vision, but is often spread over only a small portion or portions of the space. Most frequently it is as a piece of gauze,—less frequently as a cloud or mist; and some few patients have described the imperfection to me, as if produced from an irregular spot or spots, made by smearing the object regarded with Indian ink or sepia.

Whenever these spots are of such magnitude as to occupy an eighth, or tenth, or more of the field of vision, the entire field is usually somewhat obscure, or soon becomes so.

Any of the above-described symptoms may exist for weeks, months, or years, with little augmentation; though, in most instances, a gradual increase takes place; but frequently a sudden acute attack supervenes, and the vision is perfectly obscured in a few minutes.

The symptoms are aggravated by sudden emotion, anxiety, bad condition of stomach, or whatever tends to disturb the circulation.

*Appearances.*—When the simple functional derangement exists in the form of muscæ volitantes, or in that of impaired vision, there is rarely any marked change in the characters of the different textures of the eye or eyes; under the last-named affection the pupil is sometimes unusually contracted, and the iris inactive; but as soon as the vision is permanently affected by a network or web, the pupil becomes sometimes rather dilated, but subsequently again contracts, when inflammatory action is set up.

When organic change has commenced, the iris becomes dull, altered in colour,—its pupillary margin thick, irregular, and partially adherent to the anterior capsule of the lens, whilst a few large and tortuous vessels appear in the conjunctiva. When the disease has been very slow in progress, the vessels of the sclerotic do not appear injected with red blood even when the amaurosis is complete,—but most frequently its vessels become apparent, close upon the margin of the cornea, occupying a part or the entire of its circumference; they are of a dirty brick-dust colour.

Eventually, the changes which I have described as consequent upon the acute disease, take place, and capsular cataract, with synechia, or staphyloma scleroticæ may exist. Before the sclerotic coat gives way, it has a bluish appearance, and the globe feels hard and inelastic.

Occasionally the disease extends to the deeper seated tunic and humours, absorption takes place, and the globe becomes soft and flaccid.

Within a few months just subsequent to the universally-lamented death of Her Royal Highness the Princess Charlotte, I had ample opportunity of witnessing and tracing the effects of choroidal congestion and inflammation.

At the period above-mentioned, all persons were anxious to evince their feelings of sorrow and respect, by assuming as early as possible the conventional garb of grief; and consequently, an unusual quantity of work devolved on all those engaged in dress-making.

It would answer no good purpose to detail here the excessive cruelty which mercenary considerations induced many of the dress-makers, &c., to exercise over their dependents and apprentices, and which led to imperfection of vision in many, and entire loss of the blessed function of sight in several of those poor and tender beings.

Of the great number of patients who came under my observation at the Eye Infirmary, and elsewhere, in consequence of disturbance or loss of vision from the cause above mentioned, the majority were affected with muscæ in various degrees, or impaired vision; in others, symptoms of incipient organic change were manifest,—some had marked inflammation in the choroid and iris, with great obscurity of sight, and in a few the eyes were destroyed as visual organs, by disorganization of the more delicate tunics and humours.

The more robust suffered least, the most delicate became amaurotic, and generally the amount of mischief was in proportion to the relaxation and debility of the system.

The commencement, progress, and termination of choroidal disease was thus most clearly placed before me in its several stages, from the condition of simple and partial congestion, or simple functional disturbance, to the development of inflammation in the choroid and iris; its extension to other important textures, and its termination in a widely-spread disorganization.

*Predisposing Causes*—exist in those of decided strumous diathesis, or of weak and delicate frame, with feeble circulation, either congenital, or induced by mode of living, occupation, previous disease, inordinate discharges, secretions, or hæmorrhages, &c.

*Direct Cause.*—The disease is usually excited by exposure to cold or damp, bright light, or inordinate use of the organ; it is sometimes difficult to assign any particular circumstance as the immediate cause, for I have seen the inflammatory and disorganizing stages of the disease in infants, before the period at which they generally acquire distinct perception of surrounding visible objects.

The functional derangements are often caused by gastric, hepatic, or intestinal disturbance, so much so that few who participate in the luxuries of the table escape them altogether, but have now and then the volitant muscæ. The condition of impaired vision is also sometimes dependent upon and produced by the same causes, but especially by excessive use of the eyes on minute objects; and is, therefore, of more frequent occurrence among milliners, tailors, shoe-makers, watch-makers, jewellers, &c.

Choroiditis, according to my experience, is much more frequent in females than in males; it affects most generally those of fair complexion with blue irides, and seldom appears after the middle period of life.

*Treatment.*—Under this head I must consider separately the functional and organic conditions of the disease, and, further, make some subdivisions, as follow:—

1. Functional disturbances:
   *a.* Muscæ.
   *b.* Impaired vision.
2. Organic disturbances:
   *a.* Affecting choroid and iris.
   *b.* Extending to capsule of lens.
   *c.* Distending the sclerotic.
   *d.* Affecting the deep tunic and humours, and producing atrophy of the organ.

The muscæ which result from gastric, hepatic, or intestinal disturbance, are the most common, and are usually grey or dark; they appear generally as irregular lines, or small spots, and are volitant and evanescent. In persons naturally robust and healthy, they appear after excessive indulgence in food or drink, and especially when the quality of either be indifferent; loss of appetite, dryness of mouth, nausea, headach, chilliness, and restlessness, are the common attendants. Persons habitually dyspeptic are often affected by similar kinds of muscæ, which vary in number, form, size, figure, &c., and now and then disappear. In either case, they result from the irregular state of the circulation, sympathetic with, and dependent upon, digestive derangement. The principle of treatment in such cases is obvious, viz., to correct the error in the functions of the digestive organs;—and I must be satisfied with naming the principle, without describing the means, as I neither have space nor inclination to enter into a subject of such vast extent, and so complex, as the treatment of dyspepsia. I must, however, observe, that in cases of muscæ of long standing, counter-irritation, by small blisters, or mustard plasters, to the temple or forehead, is sometimes very serviceable, in addition to the general treatment.

The network, or gauze, which appears and obscures vision, partially or totally, from over exertion of the organs, and constitutes the condition termed impaired vision, results from a partial or complete congestion of the choroidal vessels, and may occur in two opposite states of the circulation:—1st, and most frequently, when the action of the heart and arteries is below par or feeble; 2dly, when the vessels are fully distended, and the action unduly violent. The general aspect of the patient, the condition of the pulse, and the influence of food and position on the vision, are sufficient to indicate the asthenic or sthenic forms of the disease. When the former exists, the patient is pale, and looks wearied; the pulse is quick and feeble, being easily compressed; the vision usually improves after meals, and is relieved by the recumbent posture. In the latter, the patient is florid and flushed; the pulse is full, quick, and hard, and the local disease is aggravated by food, or by the recumbent posture. The asthenic disease is produced by much exertion of the eyes; the sthenic arises from trivial use, or is sometimes induced merely by straining or stooping.

In treating the impaired vision, which coexists with deficient power, attention to the general health is as essential to the production of any permanent benefit, as attention to the affected organs; thus whilst the organs are rested and kept from the excitement of work and bright light, counter-irritation is resorted to in a moderate degree; the secretions should be at the same time properly regulated, and the power improved by diet, and mild tonic remedies. For example, the patient should refrain from using the eyes, except for ordinary purposes, as in dressing, walking, eating, &c.; and if there has been uneasiness or sense of fulness in the eyes or forehead, blisters should be applied to the temples or to the forehead, but not kept open. Small doses of mercurials, with mild aperients, and diaphoretics, or narcotics, are necessary, according to the state of the digestive organs, the skin, or of the nervous susceptibility: and further, some mild tonic, as sarsaparilla, cusparia, cascarilla, may be used to promote appetite, and improve digestion: in delicate and young persons, steel is often of great service. The diet should be nutritious, but not stimulating; and exercise should be taken in moderation, but never so as to create fatigue.

The adoption of this plan is easy in all cases, except in respect to one circumstance, which is of great importance; viz.—the rest of the eyes. The disease is extremely common in those who have to obtain their livelihood, and support a family also, by work which in many instances, cannot be followed without much exertion of vision, but which cannot be altogether given up. I have generally found that such cases can be cured by regulating the labour of the eyes, and steadily persevering in the other means which I have detailed. By regulating the labour of the eyes, I mean dividing the work so as to prevent congestion, and giving intervals of rest for the recovery of tone in the organs to carry them through a fresh period of employment. Thus, supposing a patient can work an hour without the vision being impaired, but not longer, he should then be directed to work only for half an hour at a time, and to allow intervals of rest to the eyes, of a quarter of an hour; he can thus work four-fifths of his usual time, while his cure proceeds at the same time. The period to be employed at work, and the intervals of rest, must be regulated by the character of the affection. As a principle, however, it may be laid down, that the period allowed for employment should always be short of that required to create disturbance of vision; but the time designed for resting the eyes should never be less than a quarter of an hour.

I have succeeded in curing very many cases by this plan of treatment.

Supposing that the impaired vision occurs within half an hour after the eyes have been employed at work, it is best for the patient to lay aside his business for a week or two until the affection be mitigated; for he could hardly adopt the plan above recommended in less urgent cases, as the periods allowed for work would be too short for him to gain much advantage by his labour. In all cases, use of the eyes with the aid of artificial light should be as much as possible avoided.

The impaired vision caused by a condition of plethora or fulness of the vascular system, is readily cured by lessening vascular tension; by the moderate abstraction of blood, a diminution of diet, and attention to the principal secretions, with rest of the organs for a few days.

The fixed and permanent muscæ, I consider to be the result of the most trivial organic change in the choroid; and usually produced by a partial morbid enlargement, or varicosity of the choroidal vessel or vessels; whilst the evanescent muscæ are, I believe, created by pressure on the retina, from a partially congested vessel or vessels. When the fixed muscæ occur, with a general obscurity of vision, and evidence of inflammation of the choroid, they may have been produced by a morbid deposit in or on the choroid which presses the retina. I have come to this conclusion, in consequence of finding that the fixed muscæ in a field of vision otherwise clear are rarely to be removed; whilst those which exist with a general disturbance of function of the retina, frequently disappear with the inflammatory action of the choroid.

The appearance of one or two dark and fixed muscæ, without any further disturbance of vision, is common, and most frequently of sudden origin; but occasionally it is preceded by the evanescent muscæ. Unless there appears a tendency to an increase in size or number of the muscæ, I now feel little inclination to adopt any particular treatment for them, but caution the patient against the exciting causes of choroid congestion. I have, formerly, in numerous instances, treated such cases by active, and by alterative and continued means, with a view to their cure, but with so little good result, that I am now content to arrest the progress of the affection; and I find that the patient soon becomes accustomed to the muscæ, which do not wholly impede his vision. Several persons whom I am in the habit of meeting often, have these fixed muscæ, but have become so accustomed to them, that they are scarcely conscious of their existence unless asked about them.

To check the increase of the fixed muscæ, the treatment which has been described as successful in removing the volitant and evanescent muscæ, is in principle that which I adopt.

Inflammation of the choroid, as a primary disease, either in acute or chronic form, is not very common, and is, I believe, but indifferently understood, being frequently confounded with iritis, of which it may be the cause; for the very intimate vascular connexion between the seats of those diseases hardly admits of the existence of inflammation in one without the other being rapidly affected.

Choroiditis, therefore, produces iritis; and iritis produces choroiditis.

It is a matter of considerable importance to form a correct diagnosis, since the success of treatment in these diseases (as in most others) mainly depends upon it. I shall, therefore, point out the marked differences in the early symptoms, and I trust render the diagnosis simple.

In choroiditis, disturbance of vision precedes any alteration in the iris, or sclerotica; and when the iris becomes sensibly affected, the change in its colour, and loss of brilliancy, is not in proportion to the loss of power in the retina; and the amaurosis is often nearly complete before any increased action is apparent in the sclerotica.

In iritis, change in colour of the iris, loss of brilliancy, and even tubercular deposit of fibrin often precedes the diminution or loss of vision; and also an extensive injection of the vessels of the sclerotica around the margin of the cornea, and a considerable degree of conjunctivitis may exist with iritis, and yet the vision be little disturbed.

It must be remembered, however, that iritis cannot well exist for many days without the disease extending to the choroid; and as soon as the choroid becomes affected, vision is disturbed and soon destroyed. If disturbance of vision precedes inflammatory symptoms in the iris, the disease has commenced in the choroid; but when change in the iris takes place before amaurotic symptoms occur, the iritis is primary, and the choroiditis secondary.

Before the iris participates in the disease originating in the choroid, the symptoms I have described must, I conceive, render the diagnosis easy; but as soon as the iris, sclerotica, &c. become implicated, the origin of the disease can only be detected by a careful examination into the history of the case.

The commencement of organic affection of the choroid, although unattended by any marked symptoms of inflammatory action, demands serious attention and careful management; the patient being otherwise constantly liable to a sudden burst of inflammation and its consequences.

The existence, then, of a network or gauze, or the appearance of large dark spots in the field of vision, unaccompanied by pain or uneasiness, or by any other evidence of increased action in the vessels of the conjunctiva or sclerotica, should meet with prompt attention and careful treatment, by which the integrity of the organ may be, in most instances, restored, and, at all events, useful vision preserved.

The organ should be perfectly rested, and kept from exposure to bright light; counter-irritation, by means of blisters or tartar emetic ointment, should be created upon the forehead or temple; the diet should be adapted to the power of the patient, but he should avoid stimulating food or drink (beyond that which habit may have rendered necessary), and such matter as is not easy of digestion, or is incompatible with the medicine employed.

Medicinal treatment should first be directed to correct errors in secretion, and restore the disordered functions,—the accomplishment of which is frequently sufficient to subdue the ocular disease; but should the vision continue disturbed, the alterative mercurial course should be adopted, and the local remedies continued. It is very rarely necessary to produce mercurial action in the system.

When the patient experiences a sense of fulness in the eye, or pain or uneasiness about the forehead or temple, in addition to the disturbance of vision, abstraction of some blood, by cupping-glass or leeches, may be required, and a more simple and abstemious plan of diet should be adopted so long as such symptoms exist; and under the continuance of this symptom, loss of blood may be again resorted to with advantage.

Blood should always be taken away in moderation, and only in sufficient quantity to relieve congestion, but not to affect the general circulation.

When decided inflammatory action occurs, the treatment must be active, in proportion to the symptoms and the powers of the patient. I have observed that the disease attacks principally those of naturally feeble constitution; therefore, if depletion be requisite in the commencement of treatment, the patient should be most carefully watched during its continuance, so that it may not be carried beyond the extent required to check the acute symptoms, nor produce unnecessary exhaustion. In many cases, when the disease is apparently acute, but the power feeble, the loss of blood aggravates, rather than benefits, the affection; this I have observed most frequently in young and delicate females. I have known the continuance of depletory treatment prove most injurious in augmenting the morbid action and hastening the disorganizing process.

Unfortunately, as relief frequently follows the local abstraction of blood, the patient in every fresh attack or relapse is desirous of resorting to the same treatment again, and the medical attendant, unacquainted with its injurious effects, readily adopts it: the relief is however of short duration; another burst of acute symptoms in a few days occurs—the same remedies are again resorted to, with similar effect, but the patient is further reduced in power, and the local disease has made some progress in disorganization; under continuance of this treatment the patient suffers from repeated attacks of the acute kind, each of which produces an increase in the amaurosis, and eventually vision is completely destroyed, while, at the same time, the general health is materially deranged, if not permanently injured.

I have seen several very distressing cases of permanent amaurosis resulting from such treatment; and I have also known many instances in which the disease has been arrested and vision preserved, by raising and maintaining the general power, and pursuing the medical treatment which I have recommended, after many weeks of depletion had failed to produce the desired effect.

I much wish that I had space to illustrate these observations by cases.

The chronic form of the disease often proceeds in such an insidious manner that amaurosis may be produced in one eye without the patient being conscious of anything more than the muscæ or spots which occur in the early part of the affection; this, however, happens very rarely; but frequently patients allow the disease to proceed to the extent of destruction of useful vision in one eye before they seek relief, in consequence of not suffering from pain. A similar insidious form of the disease may also go on, after the acute stage has been arrested, but when the morbid action has not as yet been perfectly subdued.

Before the amaurosis becomes perfect, the greater number of these cases can be remedied or much benefited by a steady perseverance in the alterative course, with attention to diet, to the condition of the secretions, and rest of the organ; now and then it is necessary to produce slight mercurial action, and maintain it for a short time.

These remarks are suited not only to those cases in which the pupil remains clear, but even to those in which the capsule of the lens has become opake, or covered by an opake deposit, and adheres to the pupillary margin of the iris, supposing that perception of light remains, and the globe retains its usual firmness, elasticity, and figure.

I believe that many of the last mentioned cases may be remedied by the union of medical treatment with operation, which would be lost by operative proceeding alone; the eye being much less disposed to inflammation after the medical course, whereas without it the operation will generally excite a fresh morbid action which will defeat its intention.

When the disease has produced a complete state of amaurosis, so that the perception of light is destroyed, the case is not entirely hopeless, unless the globe be hard, and the selerotic has in part given way (staphyloma scleroticæ), or when, on the contrary, it has become soft and somewhat diminished in size; for when the affection is of very long continuance, the retina and vitreous body become sometimes implicated in the morbid action, and partial atrophy ensues. If, in fact, the globe possesses its natural firmness and elasticity, and the pupil be clear, I consider it worth while to give a fair trial to mercurial treatment, provided that the age and power of the patient admit of its adoption without risk. The treatment required is severe, but attended with much less risk than would be supposed, when carefully conducted. It consists in establishing a full and free mercurial action, and sustaining it for several weeks or months; at the same time, however, power must be maintained by good nutritious diet and a moderate quantity of stimulus. I consider that the safety of the treatment and its efficacy depend very greatly upon the support of the general power, for whilst this is properly sustained, I believe that the remedy cannot produce any general injurious effect, though its operation upon the local disease may proceed most beneficially. Unless the general power be maintained, the effects of the mercurial action on the system are extremely distressing and injurious; and it can rarely be continued long enough to remedy the amaurosis.

These observations result from great practical experience, not only in ophthalmic disease, but in other surgical affections, in which the continued and full use of mercury is of the greatest use in arresting and subduing diseased action.

The plan of treatment should be as follows: Confine the patient to his house or room, and ascertain if the principal functions are properly performed, and if not, let any error be corrected before the mercurial course be commenced. When the patient is in a fit condition, begin with small doses of one of the mild preparations of mercury, as the hydrarg. c. cretâ, or the oxide of mercury; and allow a form of diet equal to that which the patient has been generally accustomed to, but forbid the use of vegetable acids, greens, uncooked vegetables, or such articles of food as may be likely to interfere with the operation of the mercury. Watch the condition of the secretions, and suspend the use of the medicine under any attack of diarrhœa, or disturbance of stomach or bowels; and do not resume its exhibition until the disturbance be corrected, either by aperients, in case of irritating secretion, or aromatics and absorbents when there is only inordinate secretion. The mercurial preparations should be varied and combined with narcotics, to prevent, if possible, irritation of the digestive organs or alimentary canal; and if this cannot be avoided, the internal use of the remedy must be abandoned, and the external employment of it by friction resorted to.

As the operation of the mercury becomes manifest on the system, by a spongy and tender state of the gums, it often happens that the patient becomes depressed and irritable, and requires an improvement in diet, or a little more stimulus, to keep up his power; and occasionally I have given some bitter and ammonia with good effect. The mercury should never be pushed during general depression or irritability; but, if possible, the action obtained should be maintained, and as soon as general circumstances will permit, the action of the medicine should be gradually increased, until a full effect be produced, and a free discharge of saliva occurs.

When the tenderness of the mouth prevents the patient from taking solid food, nutriment should be frequently given in a soft or fluid state; milk, eggs, good plain soups, jelly, panada, &c., will afford ample support; the extreme tenderness of the mouth may be much relieved by a gargle of alum, or of chloride of soda, or by sipping some cool mucilaginous fluid.

Although in most instances some improvement takes place in the case, during the development of the mercurial action, yet occasionally, no perceptible change occurs until the full effect of the medicine has been kept up for some time. I have known three weeks elapse from the commencement of a full state of salivation before any marked beneficial change in the amaurosis has been perceived. The treatment should not, therefore, be abandoned under a month's trial.

Cases of complete amaurosis, from choroiditis, are very rare, without such evidence of disorganization as would forbid even mild, much more severe treatment; I have, however, seen a few cases in which much benefit has been obtained by the plan of treatment that I have detailed, and although it has failed in some instances, the success of it has been such as to warrant its recommendation.

One of the first cases of this kind that came under my care, was in a powerful man about thirty-eight years of age, from the north of Ireland, who was sent to me by my late excellent friend, Dr. Babington; he had been amaurotic for seven years, and had lost the perception of light; but the globes possessed their natural firmness and elasticity; the pupils were clear but irregular, from many points of adhesion between the pupillary margin of the iris, and the anterior capsule of the lens; the irides were discoloured and dull, and he had the vacant aspect of a blind person. I admitted him into the infirmary (then in Charter-house Square), and put him under mercurial treatment, with a nutritious diet; as soon as the mouth became tender, a considerable degree of sclerotitis occurred, with pain and tenderness of the eyeballs; the plan was, however, steadily continued, and some belladonna was applied night and morning to each eyebrow; he soon became sensible of light, and gradually acquired the power of discerning surrounding objects, and at the same time the adhesions between the iris and the capsule of the lens began to give way, and the pupils to reassume their natural figures. by degrees the vision improved, all appearance of inflammatory action subsided, the pupils became nearly regular, and the irides brilliant; the full mercurial action was kept up for above sixteen weeks, when the amaurosis was completely subdued, and his vision perfect. For sixteen weeks he discharged about a pint and a half of saliva daily; but in spite of the severe treatment, he came out of the course improved in appearance, and evidently increased in bulk.

In one other case, I have known a perfect recovery from complete amaurosis under similar treatment; and in other instances a useful degree of vision has been obtained.

When the patient retains the perception of light, or of large objects, the prospect of recovery from the treatment recommended is much greater than in the cases of complete amaurosis.

The existence of capsular cataract, or opake deposit, on the capsule of the lens, renders the recovery by medical treatment alone very improbable; but, as I have observed, many of these cases may be greatly benefited by medical and surgical treatment combined.

In those instances in which a perception of light remains, although the pupil be obscured (but without other evidence of disorganization), I should recommend a mercurial course, proportioned to the power of the patient; after which, by careful operative proceeding, vision may be frequently restored to a useful though very rarely to a perfect extent. The limits of the present paper forbid my entering into the description of the appropriate operations.

The existence of staphyloma scleroticæ with amaurosis, as a consequence of choroiditis, renders the case nearly hopeless; but whilst any useful vision remains (which is possible), it may be perhaps preserved by the treatment already described. A softened and shrunken globe indicates extension of the disease from the choroid and iris to the retina and vitreous body, and such a case is past relief from medical or surgical skill.

### INFLAMMATION OF THE GLOBE.

Inflammatory action occasionally takes place simultaneously in all the tunics, and in the principal humours or their membranes.

*Symptoms.*—Severe and continued pain in the eyeball and about the orbit, with frequent dartings which extend to the brain, and produce excruciating suffering. A sense of tension of the globe, as if it would burst, with excessive tenderness, and constant scintillations or flashings of light; a sense of difficulty in moving the eye, and an aggravation of pain by attempt to move it; secretion at first lessened, and sometimes afterwards profuse; after a short time, swelling and tension of the palpebræ takes place, and the patient feels increase of suffering when recumbent.

*Appearances.*—Palpebræ swollen and red; globe appears projecting; the vessels of the conjunctiva and sclerotic distended with red blood, so as to present a dark red surface; cornea slightly hazy; iris dull and discoloured; pupil dilated and irregular or oblong; motions of iris destroyed; pupil of a muddy and generally dirty green hue.

This disease occurs at the same period of life, and under the same circumstances as the acute form of glaucoma, of which I consider it to be an aggravated and extended form.

The destruction of vision by it is so rapid and complete, that medical and surgical skill avails little in preventing amaurosis; but the suffering may be mitigated, and the inflammatory action subdued, by the same plan of treatment that I have described as necessary in acute glaucoma. The disease is protracted under the use of such remedies as tend materially to lessen general power.

### LESIONS OF THE RETINA.

Such accidents affecting the retina alone, are, I believe, extremely rare, as some of the other textures almost invariably suffer at the same time.

I have already pointed out how amaurosis occurs, from very trivial violence which does not produce any apparent disorganization; and it may therefore be imagined that more severe injury which occasions lesion of the retina would always be attended with destruction of its functions, or that amaurosis would inevitably ensue.

Such is not, however, the constant result of severe injury, as regards the entire retina, for

I have several times found that the loss of function has been confined to that portion alone of the retina in which disorganization has been produced by the injury.

I have observed the same fact in these cases, as in those in simple concussion, viz.: that if all perception of light be lost immediately after the receipt of injury, a perfect state of amaurosis remains, but if perception of light exists, the recovery of some useful or good vision is probable ; but the surgeon should be cautious in forming his prognosis in consequence of the risk from subsequent inflammation. The extent of organic lesion may in some measure guide the opinion of the surgeon. I have found the lesions of the deeper tunics more manageable under the subsequent inflammation, than rupture or laceration of the sclerotic ; indeed I hardly recollect an instance of the latter form of injury in which vision has been preserved.

The inflammatory action in the choroid and iris is readily controlled by moderate depletion, and the use of mercury, but that of the sclerotic often continues in spite of the utmost care of the surgeon; it induces much distress and suffering, and eventually other textures become involved in the diseased action, a general chronic inflammation of the globe is induced, and atrophy ensues. Such has been the termination of a large majority of the cases of ruptured sclerotic which have come under my observation; even in some in which I have had sanguine hopes of preserving useful vision (the larger portion of the retina having retained its functions nearly complete, for some time subsequent to the receipt of the injury), a slow inflammation has always defeated my expectations, although I have taken every pains to prevent it. After severe injury to the globe the iris often remains tremulous.

### FUNCTIONAL DISTURBANCE OF THE ORBITAL PORTION OF THE OPTIC NERVE.

That portion of the optic nerve which is situated in the cavity of the orbit has occasionally its functions disturbed by pressure arising from disease of the osseous parietes of the cavity, or from morbid growths or enlargements within it ; as by nodes, various forms of tumours, aneurism, &c., or from suppuration.

There is frequently some difficulty in deciding on the precise nature of a disease in the orbit ; but it rarely happens that there is any doubt of the cause of the amaurosis in such cases : for example, the globe may be protruded, and vision be disturbed or lost, and the surgeon may be able readily to distinguish some morbid growth in the orbit which occasions the protrusion of the globe, and disturbs the functions of the optic nerve ; but he may have great difficulty in determining whether such growth be of a fatty nature, encysted, or of a fibrous character.

The diagnosis, therefore, as regards the amaurosis is simple, but the prognosis, from the obscurity of the disease, or rather of the cause, is frequently difficult.

The amaurosis, in all such cases, is slow in its progress, and rarely complete, excepting when the optic nerve becomes implicated in the diseased action, and some organic change is produced in it.

Unless I were to enter into a full explanation of the diseases of the orbit, I could not, with any utility, describe their treatment, and in doing the former, I should far exceed the scope and limits of the present paper.

### ORGANIC DISEASE OF THE OPTIC NERVE.

Organic change in the optic nerve is extremely rare; whether as resulting from disease which commences in it, or extending to it from the orbit, or even as the effect of violence.

If we could distinguish accurately the symptoms which attend the commencement of the morbid action which leads to organic change in the texture of the optic nerve, we might adopt some decided plan of treatment; but I do not know of any means of effecting this ; and when the change has taken place, either from morbid action or from organic lesion, the amaurosis cannot be benefited by medical or surgical skill.

Most of the organic changes found in the orbital portion of the optic nerve do not originate in it, but are consequent upon disease which begins in the retina, or cerebral parts of the nervous apparatus of vision.

### FUNCTIONAL AMAUROSIS FROM CEREBRAL DISTURBANCE.

This form of amaurosis is seldom complete or perfect, the function of vision being either partially interrupted, or generally obscured, but not destroyed.

*Symptoms.*—The patient either loses the perception of a part or parts of a large object; thus he may see the upper half of a face without being able at the same time to distinguish the lower half (hemiopia—visus dimidiatus,) or he may be able to perceive one side of the face only,—or the central part may be distinct whilst the lateral portions are invisible ; or further, on the contrary, the lateral parts may appear, whilst the centre is obscured. Sometimes the extent of the amaurosis continues the same through the attack, but in other instances it increases so as to extend over the whole of the field of vision.

In these cases there is not any appearance of spot, spots, web, gauze, cloud, or other seeming intervening matter between the eye and object, as in choroiditis, but part or parts of the object are distinguished but very faintly, or are quite invisible.

Severe general headach, either precedes or follows the above symptoms, and the patient also suffers from nausea, with loss of appetite and general depression and chilliness.

The amaurotic affection seldom continues beyond a few hours, and evidently depends upon an irregular state of cerebral circulation sympathetic with the gastric or hepatic irritation or derangement.

*Appearances.*—The pupil is usually somewhat dilated and the look rather vacant, and the patient is pallid and cold.

I have myself experienced this form of amaurosis several times; I had two or three attacks of it before the age of puberty,—they became more frequent about the adult period, and have latterly been of rare occurrence. With me the amaurosis has always preceded the headach, and nausea, &c. and has been evidently caused by gastric irritation; but it has often come on at a time when the secretions were regular, and when the form had been of simple and plain kind.

I have been consulted by several fellow-sufferers of both sexes, and in some the cerebral pain has preceded the disturbance of vision, whilst in others it has occurred subsequently; and in a few the irritability of the stomach has been excessive and attended with violent vomiting.

I have remarked in my own case, and have found by inquiry in others, that the portions of nerve affected are not the same in each attack, but that the obscurity takes place in different positions and varies in its extent at different times.

I have known a similar form of amaurosis produced by the irregular cerebral circulation which sometimes follows concussion of the brain; the affection has then been more continued, and of more gradual development, attended by giddiness, headach, noise in the ears, irritable stomach, &c., symptoms which cannot fail to indicate the nature of the disease, when viewed in connexion with the history of the case.

*Treatment.*—The cases depending upon gastric disturbance are best remedied by an emetic, followed by an active purge, or by a dose of mercurial and opium, and a draught of senna and some alkaline purgative salt a few hours after; I have generally adopted the latter plan, and have seldom found it necessary to repeat the dose; but on two or three occasions when I have neglected to attend to the attack at first, its recurrence three or four days in succession has at length compelled me to do so; and I have been obliged then usually to take two or three doses. Attention to diet forms a necessary part of the treatment; the patient should be careful as regards both quality and quantity of food for some time.

This affection, when caused by concussion, disappears as the cerebral circulation recovers its balance under the ordinary treatment.

### ORGANIC AMAUROSIS FROM DISEASE OF THE BRAIN OR ITS MEMBRANES.

I have seen a few examples of incomplete or partial amaurosis resembling that described as functional with visus dimidiatus, &c., but of continued character, and unattended by gastric irritation or disturbance; I place it under the head of organic disease, as I consider it to result not merely from an altered circulation, but to be caused by a morbid deposit.

I have seen only three cases of this kind, and in each the obscurity or loss of vision was partial, and the pupils rather dilated, with sluggish irides, but no perceptible change in humour or tunic: the disease was of slow progress, and affected one eye more than the other.

Each patient had been the subject of syphilis, and evinced some constitutional taint having periostitis or affection of the throat, or cutaneous eruption.

The indication for treatment was, therefore, tolerably plain: mercury was administered with care, (as I have previously described) and with the best effect in removing the imperfection of vision, as well as the other evidences of syphilitic taint.

Amaurosis resulting from organic cerebral mischief presents great variety in symptoms according to the seat, the nature, and extent of the change.

1. There may be partial or complete, imperfect or perfect loss of vision without any alteration in function in any part of the structures of the eye or its appendages except the retina, and without any visible organic change in the retina itself; even the iris may act freely and rapidly although there be little or no perception of light, though most frequently the pupil is dilated rather more than natural and the iris moves tardily.

Such a form of amaurosis may have been preceded by headach or giddiness, and have been rapid in its progress, or have occurred very gradually without any marked symptom of cerebral disturbance: the latter, I think, is most common.

Under such circumstances one eye is often affected without the other, and if both are attacked, the amaurosis is more rapid in one than in the other, and frequently at the commencement of the disease the field of vision is not equally obscure.

As the amaurosis increases, the symptoms indicating cerebral mischief sometimes become developed, and the patient usually acquires the vacant aspect which is so general in blind persons.

When the amaurosis occurs rapidly the symptoms of cerebral disturbance are usually more marked than when it is of slow progress.

2. With the disturbance of vision there may be an occasional or constant appearance of double objects when the two eyes are employed, and this double vision will be generally more evident when the patient directs his attention to any object immediately before him; whilst in a lateral direction objects may appear single.

The double vision in such cases is a consequence of loss of muscular power, by which the parallel motion of the two eyes is in part destroyed, and a squint (strabismus) is produced. When, therefore, the patient regards an object directly in front of him, the axis of the organs not being parallel, the object viewed is reflected upon portions of the retina which do not correspond, or rather which have not been previously associated, and a double impression results.

Most frequently the strabismus affects one eye only; but I have seen partial and complete paralysis of some of the muscles appertaining to each.

The direction of the squint, or the direction of the axis of vision of the affected globe, of course depends upon the seat and extent of the muscular paralysis.

I have frequently observed the degree of strabismus to be so slight that it would probably escape ordinary observation, especially under a lateral or oblique view of the eyes; but it is more commonly so obvious that it must attract the attention of the medical attendant on a superficial inspection.

It may be proper to observe that strabismus is frequent from other causes; when it usually precedes the amaurosis, (imperfection of vision being the result of the strabismus,) and affects only the eye which has its movements impeded or irregularly performed.

3. Of the nerves which supply the muscles of the globe, &c., the third and sixth are most frequently influenced by cerebral disease. I have not been able to detect paralysis of the fourth, and believe that the position of its origin and its course in the cranium render it little liable to be implicated in the most frequent cerebral disorders.

The third nerve is the one which most frequently suffers, and the muscles to which it is distributed have their power diminished or destroyed; and according to the degree in which the paralysis exists the following symptoms are more or less developed.

The superior lid drops, the globe is abducted and slightly depressed, so that the axis of vision has a direction outwards and slightly downwards, from the action of the abductor and superior oblique muscles, which alone retain their ordinary power; the pupil is somewhat dilated, and the iris moves very sluggishly or is fixed, and the vision is imperfect; and if the patient has sufficient power of vision to distinguish objects of moderate size with the affected eye, such objects appear double when regarded with both eyes, except when in such a position that the axis of the sound eye is necessarily rendered parallel to that which is nearly fixed in the direction I have mentioned; it is generally necessary to raise the superior eyelid to expose the globe and ascertain many of the appearances described; and if the patient endeavours to move about when the lid is supported by the finger he is not only confused by the double vision but suffers from giddiness.

In consequence of the falling of the superior palpebra, the disease has been named *Ptosis*, (from πίπτω, to fall).

The pupil being invariably dilated in these cases proves, I think, that the branch of the third nerve which joins the lenticular ganglion is distributed to the iris, and has a material influence on its motions; and further, the position of the globe with the axis of vision directed outwards and a little downwards proves that the action of the superior oblique muscle aids in directing the eye downwards and outwards.

Paralysis of the sixth nerve is much less frequent, and causes the axis of vision to be inclined inwards towards the nose; and when combined with amaurosis the pupil is not always dilated, but most frequently of natural size, and obeys the influence of light; the iris is however rarely so active as is natural.

4. There may be amaurosis with a fixed and protruding eyeball, and at the same time dropping of the superior lid, and dilated and fixed pupil; this results from paralysis of all the ocular muscles, and the globe having lost the support of the recti muscles, either falls forwards or is in a degree projected by the elastic cellular structure which exists at the back of the orbit.

These various modifications of amaurosis are caused by some cerebral pressure, as thickening of membrane or bone, effusions of fibrin, pus, or serum, as extravasation of blood, as the growth of various tumours; or they may be produced by the morbid change which has been termed *ramollisement.*

There are usually some general circumstances connected with the cerebral mischief which may aid materially in the diagnosis when the case, as regards the amaurotic disease, is otherwise obscure. Thus the attack may have been preceded by mental irritability and disinclination to employ the mind, and there may be sensible loss of muscular power, with the commencement and progress of the amaurosis.

The pulse is usually slow and laboured, but compressible; the extremities are cold and the surface pallid, and the patient frequently has cramps when recumbent, and snores much during sleep. There is, in fact, general evidence of diminished nervous susceptibility, in the want of activity in the principal functions, in most cases, and in the majority some symptoms which may, under patient investigation, enable the medical man to form a correct diagnosis; the importance of which will be made evident shortly.

Syphilis and scrofula dispose to organic disease of bone and membrane, which may occasion cerebral pressure and amaurosis, and the latter predisposes to the formation of tumours in the substance of the brain, or in connexion with its tunics.

*Causes.*—Injuries to the head, the effects of which are often very remote; fevers, with cerebral determination; *coup de soleil;* intemperance, gluttony, violent anger, excess of mental labour, and excitement, are the more immediate causes of cerebral mischief: whilst the sudden arrest of any material, natural, or habitual secretion or discharge, or the suppression of any long-standing or extensive disease, or anything which produces a sudden tension of the vascular system, predisposes to similar disease, and favours the occurrence of apoplexy or the development of slow inflammatory action: now and then we find an apoplectic diathesis, without any peculiarity of vascular action generally; but the most insidious cases are those in which the disease is induced by mental labour or anxiety not in great excess, but in persons subject to frequent or continued derangement of stomach, liver, or some important part or parts of the alimentary apparatus.

Amaurosis from cerebral disease of organic kind is frequent during dentition, and often occurs very suddenly, as other parts sometimes become paralysed, but in most instances it is slowly developed, and the consequence of serous effusion. I have also seen this form of amaurosis produced in children by the sudden suppression of extensive cutaneous eruption, or by checking a diarrhœa. From whatever cause the cerebral mischief arises in children, it is generally well marked by the ordinary symptoms.

The most insidious forms of the disease come on after the age of puberty, and are most frequent about and after the middle period of life; but from the variety of causes no particular period of life is exempt from amaurosis from organic cerebral change or morbid deposit.

The prognosis in these cases is favourable or not, according to the extent of disease, the rapidity of its formation, its continuance or its cause; thus, when in addition to the amaurosis, hemiphlegia, paraphlegia, or other form of paralysis evince extensive cerebral disease, the prospect of restoration of vision is very indifferent, especially when the disease has occurred suddenly and the amaurosis is complete or nearly so; and the probability of recovery lessens usually in proportion to the continuance of the affection. Further, the cause of the organic cerebral disturbance will sometimes render the prognosis unfavourable; for example, severe injuries to the head, extensive apoplectic extravasations, or sudden effusions during teething, or fever, &c. I also consider the prognosis bad, when the disease makes progress with little or no interruption, and offers scarcely any variety, being rarely stationary; never mitigating, but always more or less in advance under ordinary circumstances. This happens during the growth of some tumours, and under the change termed *ramollissement.*

*Treatment.*—In nearly all the cases of cerebral disease with a diminution of nervous power, the vascular system suffers in common with other parts, and the action of the heart and arteries frequently appears to contraindicate the loss of blood in the treatment of the disease,—the pulse being slow and easily compressible, the surface pallid, and the extremities and surface cold. Every medical practitioner must be familiar with such condition as consequent upon injuries to the head and apoplectic attacks, and have observed how the action of heart and arteries rises and becomes augmented in force and frequency under the judicious abstraction of blood, which relieves the cerebral pressure and thus restores nervous energy.

The same effect is sometimes produced on the vascular system by cerebral mischief of slower and more insidious character; and it is therefore occasionally found when amaurosis is present; and such cases so closely resemble an opposite form of disease, or that termed asthenic, that much care and discrimination are required in forming a correct diagnosis. I shall refer to the subject again after I have described the asthenic disease.

With very few exceptions, the treatment of organic amaurosis (cerebral) will be comprised under the following heads:—

1. Relief of vascular turgescence by general or local bleeding.

2. Prevention of further congestion or turgescence, by diet, mental and bodily quietude, and counter-irritation.

3. Promoting absorption of morbid deposit, by counter-irritants, mercury, iodine, &c.

1. General abstraction of blood is required in cases in which the amaurosis appears suddenly with giddiness, headach, torpor, or marked symptoms of cerebral congestion, as in injuries to the head, apoplexy, or after intemperance, gluttony, anger, or suddenly suppressed secretion or discharge; or suddenly repelled superficial disease, as in gout, erysipelas, &c. In the first instances the pulse may be slow, compressible, but laboured; in the majority of cases it will be full, incompressible, and perhaps quicker than usual. The blood should be removed by venesection, and in such quantity as to produce a marked effect on the vascular system; the orifice should be large, and the patient erect during the operation: and the pulse should be carefully watched during the flow of blood, so that the stream may be arrested as soon as a decided change is perceived in the beat of the artery. With such caution this part of the treatment can rarely do mischief, for the action of the heart and arteries readily indicates the amount of loss of blood which the system will bear: thus, whilst the young and robust patient may lose to twenty or thirty ounces of blood without marked change in the beat of the pulse, the old or feeble may evince such change in pulse after a loss of perhaps not more than six or eight ounces; yet in each case the desired effect may be equally well produced.

It is not by the amount of blood abstracted that good is effected, but simply by moderating the force or power of vascular action. The indications for a repetition of the operation consist in a return of the symptoms described.

I much prefer venesection to arteriotomy in the temporal vessel, as the latter necessarily leads to an interruption in the superficial circulation by division of the artery, or from pressure over the site of puncture, to arrest the flow of blood, and because I have observed the effect of this plan of abstracting blood to be frequently prejudicial, instead of beneficial, in severe cases of ophthalmic inflammation; so much so, that I have for years abandoned it.

The local abstraction of blood by leeches or the cupping-glass is extremely serviceable in very many of these cases, either in addition to general blood-letting or singly. It should be resorted to in similar cases to those in which I have advised the general loss of blood, but in which the symptoms are not so urgent or marked. I prefer the use of the cupping-glass, and believe that the best spot for its application is behind and below the mastoid process: the removal of six or eight ounces of blood is sufficient in most instances at a time, and frequently, perhaps most frequently, a less quantity suffices in the commencement of treatment and before the influence of medicine can be established; cupping may be repeated with advantage under any augmentation of cerebral disturbance.

Both general and local bleeding may be, and often are, carried to an injurious extent, by lessening power too much.

In children, delicate females, and very feeble persons, leeches would perhaps be preferable to cupping.

2. The observance of bodily and mental quietude is too obvious to need comment.

Diet must be proportioned to the strength of the patient, and urgency of the case; generally a moderate mild nutritious form is the best; extreme abstinence is rarely required, and sometimes during medical treatment even the use of stimuli, as beer, wine, or spirit may be essential.

Cases which are slow in their development and progress, such as result remotely from injury to the head, or are consequent upon fever, excess of mental labour, or are produced very gradually by suppressed secretion, discharge, or habitual disorder, seldom require loss of blood, but are better treated locally by counter-irritants, as blisters, tartar emetic, issues, or setons; the two former modes of irritating are applicable to the cases resulting from injury to the head, fever, or mental anxiety or labour, and the more severe forms of issue and seton will be found most serviceable in such cases as have followed suppressed secretion or morbid action.

As a general rule, the medical man should endeavour to restore or promote the secretion or morbid action when it has been arrested, as the best means of subduing the cerebral disease.

3. The most powerful agent we possess of promoting or exciting absorbent action is mercury; and this is the remedy most to be depended upon in effecting the desired purpose in the cases we are now considering; the same caution and rules apply to its exhibition in these instances that I have detailed as requisite in the treatment of choroiditis.

Of the influence of iodine I cannot speak with so much confidence, but I consider it a very useful auxiliary in some cases.

I shall briefly recapitulate respecting treatment and the application of its particular forms to particular cases.

In those which result from injury to the head, from apoplexy, from intemperance, from gluttony, from excess of anger, or from sudden suppression of secretion, or morbid action, when urgent symptoms are present and the disease has been sudden in development:

1. General bleeding; abstinence; purgatives; perhaps cold to the head.

2. Local bleeding; counter-irritation; moderate diet; mercury, rather freely; perfect quietude.

When the disease is more slowly developed, and cerebral symptoms less marked, as remotely after injury to the head, or from excess in food, from mental anxiety, as after fever, or from suppressed secretion or morbid action:

1. Local bleeding, by cupping.

2. Counter-irritation; moderate diet; mercury more slowly; quietude.

In the most insidious cases, where the symptoms of cerebral disease are very slight, and the progress of the disease extremely slow, as from many of the above causes, or from syphilis or scrofula:

1. Counter-irritation, and attention to secretions, with moderate diet.

2. Counter-irritation; mercury or iodine, separately or together.

When there is marked syphilitic taint, or decided strumous diathesis, the power should be maintained by good nutritious diet, and mercury be administered cautiously; and in many of these cases I believe that iodine will effect more than mercury, or that it will materially aid the latter remedy.

I have seen so many cases deemed hopeless recover under steady and continued means, such as I have described, that I recommend them with confidence: it frequently happens, however, that little immediate good results, especially in the more slowly developed and insidious disease; but I have found that a steady perseverance has accomplished that which a moderate trial of the remedies had given little hopes of. I have gone on with a careful alterative course for months together, when the power of the patient has allowed of it, and have occasionally succeeded when hope had almost disappeared.

There are three consequences of cerebral disease found with amaurosis, which are not much under the control of the remedies I have described, or indeed of any others that we are acquainted with; they are the serous effusion constituting hydrocephalus, purulent effusion or abscess, and some forms of tumours. The first is perhaps most readily distinguished, and may be frequently combated with success in the early stage, but after a certain progress our remedies are of little avail. Counter-irritants and mercurials are, I believe, the most efficacious means.

In cerebral abscess, the symptoms are often very obscure; and I believe that if it could be recognised, nothing short of operation would afford much chance of safety.

Even more obscurity exists in the development of tumours, and there appears but little probability of ever forming an accurate diagnosis respecting many of them. I consider, however, that the treatment recommended for amaurosis from cerebral organic mischief, is that best adapted to prevent, retard, or subdue such morbid growths.

I have not had sufficient opportunity of seeing and examining cases of softening of the brain, *ramollissement*, to venture to express my opinion respecting its treatment.

The last forms of amaurosis which I have to describe result, I believe, in most instances from altered vascular action throughout the whole nervous apparatus of vision: they are not at first attended with any visible change of structure, and are therefore of a functional kind; but under a continuance of the disease, morbid alterations ensue.

I shall make two principal divisions:

1. That which results from excess of the vascular action, and which has received various appellations, as acute, tonic, sthenic, plethoric, congestive, &c.

2. That which is produced by a deficient action or inadequate supply of red blood, and has been termed chronic, atonic, asthenic, &c.

### FUNCTIONAL AMAUROSIS FROM EXCESS OF VASCULAR ACTION.

This may arise from a general fulness and tension of the vascular system, or depend upon a partial turgescence or fulness, from irregular arterial action or venous congestion.

When there is a general tension of the vascular system the symptoms are usually well marked. There is general head-ach, giddiness, feeling of heaviness or torpor; the amaurosis is most frequently of gradual development; and the patient describes objects as if seen through a mist, cloud, or network, and sometimes as invisible in part, parts, or *in toto*, without the intervention of a cloud, &c. The condition of vision depends, I consider, upon the principal seat of vascular pressure, differing, as I have before remarked, according as it may be cerebral or choroidal; there is also a sense of fulness about the head and eyes, with heat.

*Appearances.*—The eyes sometimes appear slighty protruded; the conjunctiva exhibits more red vessels than natural; the pupils are at first often contracted, but if the disease continues a few days they become somewhat dilated, and the motions of the irides sluggish: the face is frequently flushed, and the patient either restless and anxious, or heavy and inclined to sleep, and during sleep he snores loudly. All these symptoms are augmented after a full meal, or by position from which the cerebral circulation is facilitated.

The skin is hot, and the pulse full, bounding, and incompressible.

*Causes.*—Indulgence in the luxuries of the table without due attention to the secretions, especially of the bowels, is the most frequent origin of the vascular fulness; and this effect is most prevalent in those who have sedentary occupations, and are prevented from taking exercise. Now and then the plethoric state results from two or three acts of excess in diet, in rapid succession, and then the symptoms are usually more urgent and severe.

The same condition of circulation with cerebral determination comes on more slowly in consequence of arrest of inordinate secretion, or discharge, or the suppression of some long standing or habitual disorder.

When the vascular system has become turgid from any circumstance, an amaurosis is easily promoted by much exertion of vision.

This form of amaurosis is seldom found in very young persons, and is much more prevalent about the middle period of life than in those of advanced age.

It usually affects both eyes in an equal degree.

*Treatment.*—Speedy relief is obtained as regards the amaurosis by lessening the tension of the vascular system; and this is best effected by the general abstraction of blood; by venesection, so as to produce a decided effect on the circulation at the time. Subsequent repletion should be prevented by great attention to the secretions and diet, in the cases which have arisen from excess of food or stimulus; but in those instances in which inordinate secretion or discharge, or habitual disease, has been checked or suppressed, an endeavour should be made to promote a return of the secretion, &c., or a drain should be established for a time, by seton or issue, in addition to the remedies that I have previously mentioned.

The formation of issue or seton at any part will, I believe, produce the desired effect on the circulation, but a more immediate relief may perhaps be afforded to the amaurosis, by placing the counter-irritant in the neck.

If the patient will not submit to the formation of issue, &c., he should be purged frequently and actively.

When the amaurosis results from increased cerebral circulation or congestion, without a general fulness of the vascular system, the symptoms only vary from the foregoing in degree, and in general character. There is usually headach, giddiness, sense of weight or heaviness in the eyes or forehead; the loss of vision is in most instances gradual, and occurs with much variety of cloud, gauze, &c. Further, the pupils are often at first contracted, and subsequently dilated, and all symptoms are increased by stooping, or becoming recumbent.

There is not, however, heat of skin, redness of eyes and face, or much general torpor; and the pulse often indicates rather a feeble power, being quick and easily compressible, than too much force of arterial action.

The causes of this irregular vascular action are so numerous and various, that there must necessarily be some modifications of the symptoms.

Most frequently the irregularity of circulation is sympathetic with gastric, hepatic, or intestinal disturbance, as in ordinary dyspepsia, or when the stomach is disordered by improper diet, or by the influence of particular food, or by some poisons. Again, intestinal irritation from worms or scybala will produce a like effect.

With the gastric or hepatic disorder there will probably be loss of appetite, nausea, uneasiness, tenderness at the epigastrium, with sallowness or yellow aspect, and depression of mental and bodily activity.

With the intestinal irritation there will usually be found irregular state of bowels; occasional nausea; some abdominal uneasiness or tenderness, with restlessness; mental irritability, and disturbed sleep, with horrid or distressing dreams, and sometimes fever.

In many instances, however, when there exists gastric or intestinal irritation, the evidences of such mischief are so trifling that it is often overlooked, and the cases are regarded entirely as cerebral; and improper treatment is consequently adopted and persisted in.

Some remarkable modifications of amaurosis exist, which I consider as properly belonging to this division; because in many instances the symptoms of gastric irritation are well marked; and further, in consequence of the disease being relieved by remedies appropriate to gastric disturbance.

The modifications which I allude to are the marked intermittent varieties of amaurotic disease, sometimes irregular, but most frequently with regular periods of duration and intermission.

The most common of these varieties of the disease is that in which the patient has the vision obscured at sunset, and becomes relieved of the obscurity at sunrise; usually the patient loses the perception of objects of moderate size, but occasionally retains only perception of light during the attack. From the patient being able to see during the day, the disease has been termed Hemeralopia, from ἡμέρα, day, and ὄπτομαι, to see.

Hemeralopia is exceedingly common both in the East and West Indies, and especially attacks the crews of vessels stationed off certain parts of the coasts or islands. It is most prevalent during the fruit season, and has frequently (I think with much propriety) been ascribed to imprudent indulgence in this tempting article of food, which produces gastric or intestinal derangement.

It is attributed, by the sailors, to the influence of the moon, believing that it is produced by the moonbeams falling on the eyes, if they imprudently sleep exposed to them; hence the disease is by sailors called moon-blindness.

The attacks of blindness generally occur every night, but I have heard of variations in the periods of relief, so that the disease has put on a tertian or quartan form, like ordinary intermittent fever: only one case of such variety has come under my observation and care; then the amaurosis occurred every second evening, or assumed a tertian form.

Occasionally the amaurotic symptoms take place at sunrise, and disappear at sunset; this variety is very rare, and has been denominated Nyctalopia, from νὺξ, night, and ὄπτομαι, to see, as the patient has visual power during the night.

The variety of the disease, which results from the influence of some poisons on the stomach or alimentary canal, presents modifications of symptoms according to the quality and quantity of the poisonous matter introduced into the stomach, which I have not space to describe.

*Treatment.*—In the ordinary cases of gastric and hepatic derangement, attention to the secretions, and strictly regulated diet and exercise, form the principles of treatment; the subject is, however, much too extensive for me to endeavour to explain further in the present article.

Amaurosis from gastric and hepatic irritation is most frequent in persons about the middle period of life, but it is not rare in those more advanced in age.

Disturbance of cerebral circulation, with amaurosis from intestinal irritation by worms or scybala, is, on the contrary, rare in adults, and frequent in children or young persons. The former usually occasion nasal and anal irritation, and frequently inordinate appetite; whilst the latter produce nausea, loss of appetite, and much general restlessness.

In children between the first period of dentition and the time of puberty, these are the most frequent cases of amaurotic affection.

To remove ascarides or lumbricales, I know of no remedy so efficacious as calomel and scammony, or mercury, with some drastic matter; and a careful avoidance of green vegetables, fruits, &c. Turpentine as a remedy for tinea is so well known as scarcely to need mention here.

To effect the removal of hardened fæces or scybala, two remedies may be employed separately or conjointly, viz., purgatives and enemata; in my opinion both may be used with much advantage, but the latter are especially serviceable when the irritating matter occupies any portion of the left part of the colon: here again, the best purgatives are those of drastic property; I have several times seen cases in which the purgatives in common use, as senna and salts, rhubarb and magnesia, infusion of roses, and salts, &c. have been employed, and have acted freely on the bowels for days together, without dislodging the offending substance; and subsequently this has been effected readily by one or two moderate doses of calomel and scammony, or calomel and jalap; such instances must be familiar to all observant medical men.

The severity of the cerebral symptoms in some of these cases, induces the medical attendant to consider the disease as existing there; and the gastric or intestinal irritation as sympathetic, and it often requires a careful attention to the tongue and to the character of the secretions, as well as cautious examination of the abdomen, to form a correct diagnosis. Having seen frequent error in this respect, I consider it a duty to notice it particularly.

In all the cases of hemeralopia and nyctalopia which have come under my care (and of the former disease, I have seen numerous instances,) a cure has readily been effected by regulating the secretions, and pursuing a plan of diet, of nutritious, but not stimulating kind; and when a healthy state of secretion has been restored, if the disease has not disappeared, a few doses of quinine or bark have speedily subdued it.

We have not much opportunity of seeing the severe forms of these affections, but the accounts we have from medical men who have witnessed it in its worst degree confirm the opinion I had formed and have expressed respecting it.

Probably from its occurring particularly off certain stations, and from its peculiar type, as well as from the influence of quinine in very obstinate cases, we may fairly infer that it frequently results from a specific cause, which at the same time stirs up disorder in the digestive organs.

I have known cerebral determination with amaurosis sympathetic with two other conditions of distinct irritation, as during teething and during pregnancy.

Most medical men must have witnessed the frequent cerebral disturbance which occurs during the period of dentition, and must have witnessed some of the distressing effects of the continuance of this disturbance; amaurosis is one occasional consequence of such mischief.

From irregular vascular action induced by uterine irritation during pregnancy, similar effect sometimes results, and several remarkable cases are recorded.

The symptoms in either instance correspond closely to those already described, as resulting from gastric, intestinal, or other distinct irritation; but the disease is in each case limited to certain periods of life, during which alone the particular causes can exist.

I have considered these varieties worthy of separate consideration, because demanding some modification of treatment; thus the irregular cerebral circulation which occurs during dentition is speedily relieved by a free use of the gum lancet, with a careful diet, and regulation of secretions; whilst that which occurs during pregnancy usually requires little more than attention to the last-named particulars, with perhaps occasional abstraction of blood locally by leeches; for the loss of a very small quantity of blood suffices to relieve any urgent symptoms, and as the irregular vascular action cannot be entirely subdued during the continuance of the exciting cause, it would be folly to pursue medical treatment further than may be requisite to prevent severe or permanent cerebral disease.

Further, this form of amaurosis is occasionally produced from a more immediate cause, viz. from the pressure of some cervical tumour which impedes the circulation of the brain by pressing upon the carotid artery or jugular vein. The tumours most frequently formed in this situation are glandular or aneurismal; but sometimes those of encysted or adipose character are developed.

Error in diagnosis is hardly possible in such cases, and the mode of relief is obvious, though not always attainable.

### FUNCTIONAL AMAUROSIS FROM DEFICIENT SUPPLY OF RED BLOOD.

In these cases there always exists I believe a want of general power and vigour of circulation at first, but in some instances of long-continued affection of this kind, the local circulation never regains its proper force and fulness; and the supply of blood is inadequate to support the functions of the part, although the general system recovers its natural tone and power.

*Symptoms.*—The disturbance of vision is gradual, and its degree frequently varies at first; the patient generally complains of giddiness, and headach, and the pain is usually confined to the forehead, to the summit of the cranium, or to the occipital region; these symptoms are much relieved by quietude, by the recumbent posture, by a nutritious and slightly stimulating meal, or anything that increases the power of circulation, whilst they are augmented by immoderate exercise, abstinence, or whatever tends to lessen general power.

*Appearances.*—The pupils are generally dilated, and the motions of the irides slow; the conjunctiva and sclerotic have usually a blanched appearance, the face is pallid, and the patient has a distressed expression of countenance.

Generally the patient is chilly, has cold extremities, is restless and watchful, and the pulse is quick, somewhat feeble, and easily compressed, although the pulsation is accompanied, in some persons, with a marked jerk. Often the patient is morbidly irritable and fretful.

*Causes.*—All circumstances which tend to exhaust the vital fluid promote the asthenic amaurosis,—as hæmorrhages, uterine, hæmorrhoidal, nasal, or from wounds; excessive secretions, as in menorrhagia, diarrhœa, or in seminal discharges, from inordinate venery or onanism; or too much or too long-continued sucklings; profuse discharges from ulcers, &c. have a similar effect, as well as a deficiency of food, or bad food, and some poisons; and the operation of these causes is much augmented by hysterical diathesis, by influence of mind, &c.

Persons naturally of feeble power are most subject to this form of amaurosis, and it occurs most frequently between the period of puberty and the middle period of life.

*Treatment* — consists in first subduing or removing the source of exhaustion, as by checking loss of blood, or inordinate secretion or discharge.

Suppression of hæmorrhage, which is not in extreme, can be generally accomplished with facility; but when it has been long continued, caution should be used in subduing it, and in subsequent treatment, or a state of plethora may be induced.

We but rarely find asthenic amaurosis as a consequence of exhaustion from diarrhœa, dysentery, menorrhagia, or leucorrhœa; I have, however, known the vision affected under such circumstances, but the cases have been of trivial extent, and the amaurosis has quickly disappeared, as the cause of debility has been subdued.

On the contrary, asthenic amaurosis is frequent during lactation, either in young and delicate mothers who have to support large infants, and endeavour to effect this entirely by the breast, or in such as prolong the period of nursing in spite of exhaustion. In all such cases the child should be taken from the breast as soon as possible.

We have much more difficulty in suppressing the cause of exhaustion in those addicted to excess in venery or to private gratification of sexual passion. There is something peculiar and almost indescribable about the appearance of persons debilitated from such causes, that I can detect the cause very generally from the aspect of the patient; it is a mixture of anxiety, restlessness, and intolerance of society, which must be witnessed to be appreciated: this is particularly to be observed in those who practice self-gratification.

In either instance it is useless to attempt a cure unless the patient refrain from his pernicious vices. The practice of onanism, (which often leads to much more serious disease than amaurosis) becomes in some instances so confirmed a habit, that (like dram-drinking) the patient appears incapable of refraining from it, and it becomes necessary to have him incessantly watched for months before he can be cured of the unnatural propensity: probably the effect of this vice upon the mental power has much influence in lessening correct feeling and destroying moral courage.

Excessive purulent discharge which gives rise to asthenic amaurosis is generally connected with extensive disease of bone, or proceeds from a largely-exposed surface, and it usually exhausts the patient, unless the diseased part can be removed by operation.

The debility resulting from deficiency or improper form of food, has its obvious and certain remedy, except in very extreme cases.

Deficiency of red blood in the smaller vessels I consider to be the cause of diminution or loss of function in the retina which occurs in very elderly persons, in whose eyes we cannot detect any organic change.

Rest, and the recumbent posture tend materially to check cerebral mischief and amaurosis in all of these cases. The cause of exhaustion being suppressed or mitigated, the next object of treatment should be to restore power and maintain it.

This is to be effected,

1. By good nutritious diet: food should be taken at short intervals, in moderate quantity, so as not to overload a weak stomach; and a portion of stimulus such as the patient has been accustomed to will be serviceable, but it must be cautiously given, because under circumstances of much debility it is apt to produce over-excitement, which is always prejudicial; when its exhibition is followed by flushing, restlessness, and headach, it should be laid aside for a time. In these cases there is often a relish for sour and indigestible food, which should of course be forbidden.

2. By mental and bodily quietude; which are essential, as preventing further loss of power, and as aiding the operation of other remedies.

3. By medical agents, the best of which are the preparations of iron, of zinc, of bark, of strychnine, &c., and, in some cases, narcotics, and anti-spasmodic or anti-hysterical remedies are necessary.

According to my experience, the preparations of iron are by far the most valuable of these remedies, as promoting the formation of red blood, and increasing the vigour of the circulation. I prefer small and frequently repeated doses to large doses. In very young and delicate patients I usually give the vinum ferri, and commence with doses of ten minims, and even less sometimes; in those of more advanced age I employ the compound steel mixture, in half-ounce doses to begin with, or the sulphate of iron in substance in pill; and I have used largely a tartrate of iron, made by mixing fine iron filings with the crude supertartrate of potash (equal weight of each); the mass is covered with distilled water, and submitted frequently to alternation of heat and cold, being occasionally boiled, and afterwards exposed out of doors; fresh portions of distilled water are added from time to time, and the whole is frequently stirred: when the preparation has acquired a uniform dark reddish brown colour it is fit for use; of a saturated solution in distilled water, I prescribe from half a drachm to two drachms twice or thrice in each day. The preparations of iron are especially serviceable in those cases which result from hæmorrhages, from menorrhagia, from excess of lactation, or from inordinate seminal discharge.

When the cure is tedious, I find it advantageous to vary the form of the remedy occasionally, and to give it in combination with other preparations, as the sulphates of iron and zinc together, in pill or solution, or either, with the compound galbanum pill, or with ammonia, or other anti-spasmodic; these are useful additions when there is a marked hysterical diathesis; and when excess of nervous irritability exists, conium, hyoscyamus, opium, &c. may be beneficially employed.

The occurrence of headach, or a sense of tightness about the thorax, forbids the continuance of steel, or demands a diminution of the dose employed.

The preparations of bark are generally incompatible with the use of iron, but they are often of the utmost service in cases in which the latter remedy does not agree, and some preparations may be combined with great advantage, as the sulphate of iron and quinine. I think the concentrated forms of bark the best in the cases we are now considering, as the extract, the liquor cinchonæ flavæ, (of Mr. Battley) quinine, &c.

After diarrhœa or dysentery, or in cases of profuse purulent discharge, the preparations of bark are usually preferable to those of iron.

In some few cases I have employed strychnine in small doses as a tonic, (grain $\frac{1}{12}$) and with benefit; I believe that its specific effect from larger doses would be injurious.

The medical treatment must be modified according to the peculiar features of the case; the object is gradually to increase power and promote the formation of red blood; the appropriate remedy must be selected by the medical attendant, it would be almost an endless as well as useless task (in my opinion) to attempt to explain more than I have done in reference to the treatment of the numerous modifications of asthenic amaurosis.

I have already alluded to the close resemblance which exists between some of these cases, and those in which the amaurosis is caused by cerebral pressure; and the consequent liability to mistake in diagnosis and treatment; this point, perhaps, will be best illustrated by a few cases.

A young and delicate female, about seventeen years of age, having great nervous susceptibility, and disposed to hysteria, was accidentally thrown from a gig with her father, who was a very large man. She fell upon her father, and was taken up without any mark of injury; she was however dreadfully alarmed, and soon after attacked with a violent fit of hysteria: several hours elapsed before she could be roused from this under the use of the ordinary treatment, by stimuli, anti-spasmodics, &c. She then complained of excessive headach, with giddiness, confused vision, and heat of head; the stomach was irritable: she suffered from great mental depression, and could not procure sleep. Whilst in this state her medical attendant (believing that she had received some concussion of brain by her fall) bled her: she fainted after the loss of about eight ounces of blood, and remained a long time in a condition approaching syncope. In a few hours afterwards her previous symptoms were renewed and became much aggravated, the headach almost intolerable, the depression excessive, and the affection of vision increased, so that in forty-eight hours after the venesection she could not discern light. A few hours after the amaurosis was complete, she was brought to me, still labouring under the symptoms last mentioned; but, in addition, I found her pallid, with cold extremities, and a quick, feeble, and easily compressible pulse: the result of the abstraction of blood was sufficiently indicative of the nature of the affection, and to prove its asthenic character. I directed perfect quiet, the recumbent posture, small portions of nutritious matter to be given frequently, ten drops of the vinum ferri to be taken in weak wine and water every four hours, and an occasional dose of the compound decoction of aloes with manna, and a few drops of aromatic spirit of ammonia as an aperient. In forty-eight hours from the time I prescribed for her, her symptoms were greatly mitigated, and she began to perceive light again; she soon recovered her ordinary condition of health, and lost her headach, feeling of depression, &c., but the functions of the retina returned very gradually; so that several weeks elapsed before she could tell the letters in the title page of a common octavo work; being so far restored, I lost all knowledge of her for several months, when she was again brought to me nearly in the same state as when I first saw her; her father had failed in business, and she had suffered much from anxiety and privation, and had neglected all treatment. I put her under the same plan of treatment again, gradually increasing the dose of steel, and occasionally varying the form of medicine; her health was rapidly re-established, and a very slow improvement took place in vision, but after many months' careful perseverance in the above means she obtained only sufficient vision to be able to make out a large print. I subsequently tried blistering, electricity, galvanism, and strychnine, but without any further benefit.

Connecting the early symptoms of this case with the fall, many medical men would probably have treated it in the outset in the same way. Had there been a careful examination of the pulse and circulation, and had the condition of these been carefully viewed with the other symptoms, it would have been perceived that the cerebral symptoms could not be depending upon excess of vascular action; the pulse which exists, in cases of cerebral mischief from injury, is either quick, sharp, and incompressible, or slow, laboured, and of moderate force. I have never found, under such circumstances, the quick, feeble, and easily compressible pulse, which occurs in most asthenic diseases.

A gentleman, about thirty years of age, tall, well formed, and strongly made, consulted me in consequence of his being nearly blind, having only the perception of large objects.

Belonging to an opulent family, he had availed himself of the opinions and advice of nearly all the medical men of eminence in the metropolis, and also of several provincial medical men: all whom he consulted viewed the case as one of cerebral disease of sthenic character, and the remedies employed were local and general bleeding, all the varied forms of counter-irritants, cold lotions, shower-baths, mercury, purgatives, abstinence, and, in fact, all means calculated to lessen power and subdue any acute action. He only obtained some temporary relief from headach from loss of blood, but always had it in an increased degree soon after; otherwise, he continued gradually to get worse. When I first saw him he had amaurosis in the extent mentioned, severe occipital and cervical pain, which was constant; he was giddy; he suffered from constipation and dyspepsia; he was impotent, and had numbness and deficient power in his thighs and legs, so that he could not walk steadily without assistance, and he was incapable of making any great mental exertion; he had lost flesh considerably, was pallid, with cold extremities, and had a quick, feeble, and compressible pulse; his symptoms were somewhat mitigated by a nutritious meal, and by the recumbent posture. I had no doubt from these symptoms that the disease was of asthenic character at that time, but felt some doubts as to its mode of origin or commencement and progress, in consequence of the uniformity in the opinions of so many medical men of high reputation; but a careful inquiry into the history of the case soon satisfied me that the opinions previously given and acted upon, had been formed too hastily and erroneously. The patient, with good person, and ample means, had entered the army when young, and as opportunity occurred he indulged to excess in sexual intercourse—so much so, as frequently to render himself incapable of ordinary exertion for days together; after a few years his sexual power began to decline, although the venereal appetite continued; and he suffered from frequent nocturnal seminal discharges, when he was almost impotent in other respects; he then begun to lose vision, objects appearing cloudy, and he experienced frequent headach and giddiness, the pain being generally about the occipital region; from this period, under various medical advisers, he was almost uniformly depleted, and by degrees he acquired the melancholy train of symptoms which were present when I first saw him.

I directed him to obtain apartments in a quiet situation; to avoid all society likely to excite him; to take exercise twice a-day in fine weather, for a short time, not so as to create fatigue; to clothe himself warmly, and to recline on a sofa frequently in the day. His diet was to be nutritious, animal food at breakfast and dinner, and a moderate quantity of wine with the latter; the meals to be taken with great regularity, to dine early, and to be careful not to distress the stomach by quantity of food; he was to use a shower-bath every morning on rising, from which he had previously experienced some benefit, feeling refreshed and with more energy from it. At first I prescribed small doses of the vinum ferri, and then the sulphate of iron in substance in pill; afterwards I added a small portion of sulphate of zinc to the pills; the doses were small and frequently repeated. A few weeks after he had commenced this plan a very marked improvement took place; the pains in the head entirely subsided, he experienced very trifling giddiness, the nocturnal seminal discharges became much less frequent, the dyspepsia diminished, he felt more general power and energy, and he began to discern objects about his room which he had no previous knowledge of. By a steady perseverance of more than twelve months he was perfectly restored to health and sexual power, but he only regained sufficient vision to enable him to see a large print or letter, and consequently to guide himself about, and to recognise all ordinary objects in a favourable light. Within twenty months from the time of my first seeing him he married, and is now the father of two fine children; his health has continued excellent, and his vision has, in a trifling degree, improved.

I consider this as a highly interesting and instructive case, evincing the fact I have insisted upon as regards the error in diagnosis in these cases, and proving the necessity of careful and extended inquiry into the history and progress of disease. Several whom the patient consulted, I am satisfied, never would have committed such great error in diagnosis, and consequently in treatment, had they patiently gone into the history of the disease.

I could mention many other cases illustrative of this important point.

On the other hand, there is sometimes much difficulty in discriminating cases in which the amaurosis is produced by cerebral organic mischief from the asthenic cases. I shall relate two cases which will fully explain this:—

A lady about forty years of age became the subject of amaurosis, nearly complete in one eye, and imperfect in the other, a few weeks after miscarriage, during which (it was stated) she lost a large quantity of blood: the amaurosis had been rather rapid in its progress. She was brought to London after several weeks had elapsed, and she had undergone rather active treatment by cupping and mercurials principally; leeches and blisters had also been used, but the disease had advanced. I was requested to see her, and found her very pallid, with cold extremities, feeble, rather quick and compressible pulse, great despondency, and prostration; slight strabismus existed; the right eye-ball projected rather more than the left, and its visual power was almost gone; the left eye retained sufficient power to distinguish large objects,—the pupils were dilated and fixed; a degree of numbness and loss of muscular power affected one side of the face: she suffered from constant dull headach, which was relieved in a degree when she assumed the recumbent position. The general symptoms and non-effect of depletory treatment connected with the history of the case, especially the circumstance of large loss of red blood, gave it the character of asthenic disease, whilst the strabismus and partial paralysis of face, created strong suspicions of some organic cerebral disease. I considered that there might be some partial serous effusion or softening about the brain, to account for the last mentioned symptoms, and yet the case be one of asthenic kind, for I have no doubt that organic changes can and do take place, and often with frightful rapidity, when the general power is much below par. Under this conviction I prescribed much as in the last-mentioned case, and was deceived by some degree of improvement, for she became easier and had more animation about her. After a short time, however, she again began to decline, and in a few weeks died with more evident symptoms of serious cerebral disease. On post mortem examination a large abscess was found in the left hemisphere of the cerebrum extending into the anterior and middle lobes. I believe that the suppuration had commenced before I saw her, and that medical or surgical skill could have availed little, even with correct diagnosis. This, however, does not lessen the interest of the case, which presented a train of symptoms extremely complex, and which could very rarely be observed again. The patient was not in a state to give me any detailed account of her early symptoms, and the statement received from her medical attendant in the country was little more than a history of the treatment that he had adopted.

My friend Mr. Walker, of St. George's Hospital, requested me to see a lady about twenty-eight years of age, who was the subject of amaurosis complete in the left, and nearly so in the right eye. The pupils were of different sizes, the left rather the largest, but not much dilated; the motions of the irides were very sluggish, and there existed a very trifling degree of strabismus. She was pallid, with cold extremities, and complained of great mental and bodily depression; she was most easy when allowed to be perfectly quiet and reclining, but not perfectly recumbent; her pulse was feeble, and compressible, but not rapid. All these symptoms had come on shortly after miscarriage attended with flooding, as she said, to a frightful extent. So far the case had the marked characters of the asthenic form; but the condition of the pulse, which I thought to be laboured, and the existence of slight strabismus, made me hesitate and inquire further, when I discovered that she was very uneasy when perfectly reclined, and whilst in such position that she suffered much from severe cramps in the limbs. I had then no longer a doubt of the nature of the case, and immediately directed her to be cupped behind the mastoid process, and began the exhibition of mercury, enjoined quiet, and a simple light diet.

The mercurial treatment was carried to an extent to affect the mouth, but not severely; her recovery was perfect in about six weeks. Had I hastily formed my diagnosis from the prominent features of the case, and taken as a fact the important statement about the flooding, I should have treated the patient as suffering from asthenic disease, and probably have induced a fatal termination. I have seen many other cases in which a superficial view and examination might have led to most serious error.

### CONGENITAL AMAUROSIS.

Many instances of congenital blindness are connected with mal-formation of the organ,—they are evident and irremediable.

In some cases the eyes are well formed, and even the functions of the iris perfect, but no perception of light.

In others, with a well-formed organ, there is a very imperfect function; the distinction of light from darkness being all the patient is conscious of, and even this is lost as the person advances to puberty.

It is very difficult in the first few weeks, and sometimes for months, to tell decidedly whether a child be amaurotic or not, when the eyes are well formed; but all doubt is soon cleared up when the period arrives at which a child usually begins to take notice of surrounding objects, for the aspect becomes vacant and unmeaning, instead of animated and intelligent.

When congenital amaurosis is imperfect, and the child discerns light, and perhaps would be capable of seeing large objects, a remarkable involuntary motion of the globes is acquired, and is ever after retained, although complete loss of sight ensues: generally it is a rolling of the eye-ball, sometimes a kind of oscillation; it is, I believe, acquired by the constant and eager search after light.

I believe that all the congenital amaurotic affections depend upon deficient development in some part of the nervous apparatus of vision, and that they are consequently beyond the reach of our science or art; they are occasionally confounded with cases of amaurosis from cerebral mischief, which are frequent in children, and often admit of relief as I have described.

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I shall conclude with some brief observations upon the divisions and subdivisions of the subject, upon the pathology of the disease, and upon its treatment.

The division that I have adopted has been the result of very extensive observation and careful consideration, in which it has been my constant endeavour to elicit practical good, and I trust that I have exposed the general and principal symptoms appertaining to each form of the disease, with sufficient clearness, to render the majority intelligible to the well-informed practitioner.

Perhaps some varieties of the disease would have been rendered more distinct by being illustrated by cases, but I have purposely avoided the introduction of more cases than I considered essential to perfect explanation.

It must be understood that I have confined myself to the description of those forms of amaurosis most generally met with, and have endeavoured to mark the boundaries of each form. There are, however, frequently combinations and modifications occurring, which I have not yet worked out sufficiently to make their introduction here of much utility; they are, indeed, like the combinations and modifications of many other diseases, of such variety, and often of such intricacy, that I believe only very few will admit of distinct and useful exposition.

The subject altogether is, in my opinion, far from complete, and I think it probable that further observation and experience may induce me to modify the present arrangement.

I do not pretend to any merit or novelty in my arrangement of the subject,—it partakes of many that have preceded it, though I believe it does not resemble any one *in toto*.

On the pathology of amaurosis little can be said, for little is positively known; various morbid changes have been discovered in the retina, the optic nerve, and in the cerebral part of the nervous apparatus; but these discoveries have, for the most part, taken place at a period remote from the occurrence of the amaurosis, and we rarely have opportunity of inspecting the condition of these structures anatomically in cases of recent disease, therefore we cannot accurately decide upon the exact changes which produce several forms of amaurosis.

Many of the changes in structure which we find in our examinations of amaurotic cases, I believe to be the effect, and not the cause of the loss of vision; this happens especially with respect to the optic nerve, which nearly always loses its natural character under continued amaurosis which has been of cerebral or retinal origin; the performance of its appropriate functions appears to be essential to preserve the integrity of each part; and if the function be annihilated the part usually undergoes some alteration. The result of post mortem inspection of cases of amaurosis would lead us to suppose that atrophy of the nerve was the most common cause of the disease, but I believe that we should greatly err in coming to such conclusion solely from the fact observed so frequently in the dissection.

Further, the changes discovered after death in the retina, or in the cerebral portion of the nervous apparatus, may be produced by morbid action, subsequent to the amaurotic disease; in fact, the truth can only be obtained on these points by careful examination of these structures, during the progress, or at the completion, of the amaurosis; and our opportunities of doing this are so rare, that a very long time must elapse before any positive conclusions can be formed. These circumstances must retard the progress of our inquiries, and our endeavours to perfect this division of ophthalmic diseases. I fear that we shall not comprehend some of the more intricate cases, until recent dissection shall have much advanced our pathological knowledge of the disease. It is true that in a great majority of amaurotic complaints, a careful inquiry into the history and symptoms of the cases enables us confidently to form our opinion of the seat and nature of the disease, but there are many cases which are obscure from our ignorance of the nature of some of the pathological changes.

I have but slightly mentioned, or in some instances have altogether omitted, to notice many general and local remedies which have been strongly recommended by others as serviceable in the cure of some forms of amaurosis; the reason is, that I have tried them, and found them almost useless.

As general remedies, I may mention phosphorus, arnica, strychnine, emetics, &c.; the two last I have described as serviceable in some cases; the former, as a tonic in small doses, in asthenic cases; the latter, as useful in some cases of irregular circulation, with gastric irritation.

I have frequently tried the influence of strychnine in cases of amaurosis, which I considered most appropriate for its use, but I have been very greatly disappointed in its effects; I have not seen one single instance of benefit from its employment in the manner generally recommended. I have, indeed, tried it in various ways, externally and internally, and have continued it till the involuntary muscular contractions have been frightful, but without advantage to the amaurosis.

There are many cases in which the power of the retina is slowly restored, when the cause of the amaurosis has been subdued; as after concussion of the globe, after cerebral disease, or pressure on the optic nerve, the recovery is promoted, in such instances, by stimulants, as electricity, galvanism, ammoniacal vapours, blisters, &c.; probably strychnine might aid equally, but I am satisfied that its effects have been greatly overrated, and that serious mischief has resulted from its indiscriminate use.

A fair and careful employment of the veratria has brought me to similar conclusions respecting its efficacy.

The use of stimulating vapours, lotions, ointments, drops, &c. to the eyes, or the employment of pungent and irritating snuffs, may relieve a little by creating a discharge, in some cases of organic or congestive ocular amaurosis; but they do not, as far as I have seen, produce so good an effect as a small blister to the brow. Electricity, galvanism, magnetism, &c. which I tried extensively, are feeble aids in relieving amaurotic diseases; I have rarely seen more benefit than some trifling acceleration of recovery from their employment.

The older writers on the subject of amaurosis are, for the most part, very confused, and the vagueness of their opinions of the disease is evident from the terms they have applied to it; they appear to have considered it altogether local.

By degrees, however, more careful observation proved the connection of these diseases with general constitutional disturbance, or with irritation or disorder in some other important organ, as the stomach, &c.; hence have arisen the divisions into the plethoric, that from debility, the sympathetic, the symptomatic, &c., as employed by Richter, and others.

More modern authors have continued to use these terms, and have added others, but in their arrangement of the subject, its divisions, and subdivisions, no two hardly agree: perhaps no better proof could be advanced of the difficulty and imperfection of the subject.

More has been elicited during the last half-century respecting ophthalmic diseases generally, than during centuries preceding, from the circumstance of their having been investigated on scientific principles; we are especially indebted to our professional brethren in Germany for their labours in this department, which have excited a similar spirit here and elsewhere, and which cannot fail to be highly advantageous to this branch of medicine.

In my humble opinion, however, our foreign friends have, in some respects, rather increased the difficulties of this and other subjects, by the numerous minute divisions they have instituted. It is certainly important in forming our diagnosis and plan of treatment, that we should be acquainted, not only with the direct, but also, in many cases, with the remote cause of the disease, as it now and then occasions some peculiarity in the case, and modification of treatment. When we find, however, that many various causes create a similar morbid action, which requires a uniform plan of treatment, I conceive that no practical good can result from a separation or division of such cases—but the contrary. I allude to the divisions, or rather subdivisions of Beer, Jüngken, and other German authors, and which have been adopted, in many instances, by some English writers on the subject; and in which several causes that create similar morbid action, and produce amaurosis of like character, are treated of as distinct or separate diseases: for example, suppression of secretion or discharge, or of cutaneous eruption, may, and often does, produce great disturbance in the circulation, with irregular determination of blood, from which some one part or organ more especially suffers,—it may be an abdominal or thoracic viscus, or it may be the brain or the eye, and in either of the latter instances an amaurosis may be produced; but the local disease presents no particular symptoms, or is not specially modified by the remote cause; it has the same character, whether it be the result of suppressed perspiration, suppressed lactation, suppressed catamenia, suppressed diarrhœa, suppressed hæmorrhoidal discharge, suppressed suppuration, suppressed cutaneous disease, &c. &c. The direct or immediate cause of the amaurosis is the same in all, viz., a morbid action existing in the brain, or in the eye itself: there ought not then, in my opinion, to be any division of such cases.

In my observations upon this subject generally, I have remarked the following circumstances, some of which have been previously noted by others.

That amaurosis from organic disease, without violence, of the retina, generally attacks the eye with dark-coloured iris; that it affects females more frequently than males; that it seldom confines its ravages to one eye; that it occurs in elderly persons, and that there is often hereditary disposition to it.

That amaurosis from disease in the choroid coat occurs most frequently in persons with light-coloured irides, of feeble power, especially in those of scrofulous diathesis, and that it appears during the early period of life.

That all occupations which require continued application of vision to minute objects, and especially such as are altogether sedentary, tend to promote congestive and organic amaurosis.

That I have never been able to trace the disease to the influence of stimulating or irritating vapour or gas on the organ.

That I have seen a congestive form of the disease of metastatic character in gouty and rheumatic persons, but it is extremely rare.

It will, doubtless, be remarked during the perusal of this paper, that I have not referred to any other opinions. I have purposely avoided it, considering that a full acknowledgment in this place of my having derived much valuable information from the works of the authors I shall name would be sufficient; honesty and justice compel me also to offer my warmest thanks to Dr. Farre, for his liberality and kindness in freely giving me, at all times, the result of his extensive experience, and his close observation, during nearly twenty years in which we have been colleagues.

*Of feigned blindness.*—Amaurosis is a disease which is very often feigned, and much difficulty occurs in some cases in detecting the attempt at imposition. In all these cases both eyes are said to be affected, though perhaps one is described as most defective, for the purpose intended by the feigner would rarely be answered unless all useful vision were supposed to be lost. Further the eyes have generally a perfectly healthy character in appearance, in action of irides, and in feel of the globes, unless the party be acquainted with the effect of belladonna, or some other of the narcotics which produce a similar effect, and has employed some previously to produce a dilatation of the pupils; this much increases the difficulty of detecting the imposture.

The classes of persons who feign in this way are children, and apprentices to get relief from tasks or work, or the latter to get free from an employment they dislike; soldiers and sailors to obtain remission of duty; members of benefit clubs or societies, in which liberal assistance is afforded to sick members. Now and then I see a case in which I cannot detect any reason for the attempt to impose.

I shall first detail the most marked differences between these cases and cases of actual disease, and afterwards the modes of detecting the feigned disease.

Unless the belladonna or some other preparation, which produces like effect upon the iris, has been applied, the eyes of the impostor present their ordinary and healthy characters, but there is usually some degree of assumed vacancy, and occasionally this symptom is well imitated.

In what cases of amaurosis does the eye preserve a healthy character and the iris a free motion? In some cases of congenital disease, and in the cat's eye of Beer, in which the morbid appearance is very difficult to detect without a previous knowledge of its existence; but with this, and with a dilated pupil, and modified light, it can be seen at pleasure.

The history of the case and careful examination would readily decide on either of these points.

In amaurosis from cerebral disease we have occasionally an active iris, but very rarely so; generally the pupils are more or less dilated, or one is so, or some degree of strabismus exists. I have never seen a perfect case of amaurosis from the cause mentioned, without some loss of power in one or both irides: here again the history and progress of the case will usually elicit the true disease.

All the other forms of amaurosis, when perfect, are attended with some organic change, or interruption of function in the iris or appendages of the eye, which cannot be feigned, and are not therefore likely to be mistaken.

The detection of the assumed disease may very often be made in getting the history of the case, provided the patient be allowed to tell his own story (which I consider best in all cases at first), for he is rarely sufficiently conversant with the ordinary symptoms to make a correct case; he will probably describe symptoms which are incompatible with each other, or such as could not exist without other evidence, or some material errors may be detected by the well-informed medical man; at all events by this means we gain much to lull or increase our suspicions. After this, an accurate examination should be made of the eyes, without and with the aid of belladonna to dilate the pupils; for unless the disease has been of long standing, or the belladonna, or other matter producing the same effect, has been previously used, the pupils will dilate, from the use of belladonna, further than apparent when first examined: this may then enable the medical man to judge whether the pupils have been acted upon by medical means or not, to aid imposition.

During the explanation of the patient, and the examination of the eyes, do not, if possible, excite his suspicions of your opinion of any attempt at imposition, but rather endeavour to obtain his confidence by a little well-timed pity, and agreement with his account,—you may thus often disarm him; whilst otherwise, by creating suspicions, you alarm him, and he is constantly on his guard. If he be unprepared, the sudden approach of the finger, or any extraneous matter to the eye will cause a sudden blinking, if there be not amaurosis; or you may observe that his eyes regard any one you may address quickly; or, if you attract his attention mentally, he will perhaps unintentionally be induced to direct and fix his eyes upon your countenance, as a person in earnest conversation usually does.

When suspicion is excited, or when the party is well upon his guard, it is sometimes very difficult to prove the existence of visual power; but I have seldom failed to do this satisfactorily by perseverance.

I have succeeded immediately by the following means:—During conversation dropping some small object, as a knife or pencil suddenly, which has been immediately picked up by the patient—pretending to see something in the room, or out of the window (if near) of curious or unusual character, the patient has been unguarded for a moment, and his eyes have followed the direction I have pointed to; asking how the patient's dress became torn or dirtied, his eyes have immediately been directed to the part mentioned or pointed to, and several other like expedients. In one case, of a little girl, which baffled me for two or three weeks, during which period she had been strictly watched but nothing elicited, I was engaged in conversation with her about her medicines, which she had much abhorrence of, and after trying to persuade her to take them well, I said I would give her sixpence if she would promise to do so, she assented, and I held out a halfpenny towards her, which she directly said (without touching it) was not a sixpence: she had previously sat for hours together without moving, and would allow me to place my finger or other matter in contact with the cornea without flinching. Children generally sham blindness badly, and can be pretty easily detected, by keeping them on short allowance for a few days, and then placing some tempting food in the room with them, and leaving them for a little time alone; and this plan often succeeds with adults—few persevere for any length of time in feigning total blindness, as they cannot bear the restraint it imposes upon them.

An imperfect amaurosis is sometimes pretended which requires much judgment to decide upon; the history of the case and the integrity of the organs are the best tests to guide the professional man.

I recommend the attentive perusal of the following authors to the student in this division of ophthalmic medicine:—

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(*Frederick Tyrrell.*)

AMBE, (from ἄμβη, the summit, or projecting point of a rock,) an instrument now obsolete. It was invented, it is said, by Hippocrates, for the reduction of luxation of the head of the humerus. It is described and represented in Scultetus's *Arment. Chir.*

It was composed of two pieces of wood, united by a hinge, the one rising vertically from a pedestal, the other extending horizontally from their point of union: the latter, which is excavated for the purpose, receives the luxated limb, and straps are used to secure it in this situation. The angle formed by the junction of the two pieces rests in the axilla. By pressing on the horizontal branch, extension is made, while the upper part of it helps to press the head of the humerus into the articular cavity. The inconvenience of this antique machine is, that it does not fix the scapula, and that it presses upon the head of the bone before the extension is sufficient to insure its easy return into the glenoid cavity.

(*Wm. B. Costello.*)

AMBLYOPIA. (See AMAUROSIS.)

AMBULANCE, from *ambulare*, to move about; denomination given by the French to an establishment in their armies formed for the purpose of affording prompt and efficient means to relieve the sick and wounded in the field. While every branch of the British service is remarkable for superiority of discipline and equipments, it has been a matter of surprise that no attention has ever been paid to the formation of an hospital corps. This neglect was sadly felt during the late war. The talents and personal efforts of medical officers are of little avail if they have not proper and sufficient assistance, afforded on the exigencies of the moment in the hurry and tumult of war, but previously formed and organized upon a systematic and liberal plan. Above all things it is necessary that this assistance should be independent of the ranks of the army, which are too much thinned by the casualties of the service.

A steady non-commissioned officer and well disciplined soldier are too valuable to be detached from their regiments, and commanding officers very naturally will endeavour, on such occasions, to get rid of the worthless; hence are orderlies, generally speaking, the worst description of soldiers. Every duty connected with the service of the sick or wounded should be performed by men trained for this special duty under the military command of their respective officers, but placed at the disposal of the medical department.

Such a corps must be considered in two points of view: 1st, as regards the *persons* of whom it is composed; 2nd, as regards the *objects* with which it should be supplied: the former arranged into field companies, with a view to the services they have to perform; the latter affording means of transport for the wounded, carriage for the necessary field stores and surgical equipments. A field company ought to be attached to every division of the army, and subdivided according to the brigades of each division of various arms, each company to be in the proportion of 20 rank and file to 1000 men; bearers on the most approved plan to be provided in the proportion of one to every 100 privates. The means of transport necessary for the corps should consist of two improved light spring waggons for each brigade; and one long car capable of bearing off eighteen wounded men, nine on each side, to each regiment. Thus a division of 10,000 men, divided into four brigades and about fifteen battalions, would take the field with eight spring waggons, fifteen long cars, and 100 bearers. When unemployed in the field, these cars might prove highly serviceable for the transport of the light bedding of each regiment, consisting of twelve palliasses and bolster cases, twenty-four pair of sheets weighing 96lb., to which might be added twelve rugs weighing 88lb. In addition to this conveyance, two light store waggons should be attached to each division, their body divided into compartments, and covered with a tarpauling. These cars should carry the following indispensable articles for the establishment of field hospitals, when most probably the theatre of war cannot afford the necessary means. Four bell-tents, two large camp-kettles, two large tea-kettles, twenty-four tin cans in series, a triangle for suspending kettles, two leather water buckets, two light stretchers for operations, two light folding stools for ditto, forty-eight palliasse cases, forty-eight sheets, forty-eight spare blankets, one set of butchers' knives and cleavers, four bill-hooks, two spades and girdles, two felling axes, two light hand-saws, four lanthorns, four lamps, packing thread and needles, pins and tape, cord and twine, lint, tow, linen bandages, compresses, rollers, sponges, splints, arm-slings, oil cloths, wax-candles, torches, cotton wicks, with a small supply of groceries, brandy, and wine. Linen for dressings or lint should be furnished abundantly to every ambulance; and in order that it may occupy but little space, it should be chosen fine, and packed into cases made for the purpose. When kept in large quantities, excluded from light or air, it is liable to become mildewed. Lint or linen thus damaged, may often be productive of bad effects on the wounds to which they are applied as dressings; and even give rise, under unfavourable circumstances, to hospital gangrene. Should the quantity fail, tow may be used in its stead; when cut into proper lengths, bleached in a chloruret, and properly carded, M. Gama, who first used it, states that it answers the purpose perfectly; but charpie should not be used at all, as it may have been prepared from foul linen, and as it contracts hurtful alteration much more readily than lint. All portable articles to be packed up in small bales, cags, or packages duly labelled, that in roads impracticable for wheel carriages, they may be carried on *bât* horses or mules. These articles should occupy as little space as possible. One of the great objects to be held in view is the facility and celerity of transport; the economy of space and weight therefore is matter of importance. There should also be a supply of liquid acetate of lead, and of the watery solution of opium; the former for ready application with water to contusions, sprains, and profound lacerations, in which the skin remains whole; the latter, to wet the dressings in cases of torn wounds, burns, &c., produced by explosions of shells, the bursting of guns, &c. Wax candles are indispensable, as without them no efficient succour can be given to the wounded on the field after night has fallen; no operation performed; and thus too often, would the bleeding soldier be exposed to perish from wounds which care and timely attention would heal.

The foregoing is the divisional detail of transport, but a reserve park of spring waggons, and long cars in the proportion of two of the former by division, and one of the latter by brigade, should move in the rear of head-quarters for the purpose of replacing deficiencies, and further assisting in the evacuation of field hospitals.

Although the hospital corps is chiefly intended for the service of the wounded in the field, yet it is to be employed in the hospitals of the army when in quarters. In which case, orderlies detached from their regiments would rejoin their respective corps, where they would again reap the benefit of regimental discipline, and lose those unsoldier-like and slovenly habits that such men are liable to contract when away from their officers. The French organization of their *ambulance* companies might serve as a model for their formation. It is as follows:—one captain, one subaltern, one sergeant-major, one pay-sergeant, five sergeants, or upper ward masters when in hospital, ten corporals or under ward masters, two bugles (indispensable for sounding halts and advance in the transport of wounded), ninety-six privates or orderlies, one tailor, one shoe maker, one cutler (a most useful artisan to keep surgical instruments in repair), one carpenter, four cooks; when employed in hospital, these are distributed in the proportion of one ward master for every hundred patients, and one orderly to every twelve. The waggons and cars, with their drivers, will be also under the command of their proper officers; non-commissioned officers, with wheelwright, farriers, saddlers, &c. &c., are also to be attached to the corps.

*Duties upon a march.*—Troops usually move by divisions and by brigades. Previously to their marching, the *ambulance* and hospital corps should be formed on the assembly ground, and all men unable to proceed with their corps should be brought to this spot by one of the regimental medical officers, who will leave with the medical staff officers attached to the ambulance a return of cases. The regimental cars to move in the rear of their brigades, when not otherwise ordered by the general officer in command. These cars to receive and carry the packs of weak men not requiring transport. The hospital corps and the spring waggons to move at some distance in the rear of the division, picking up and carrying such men as had not been able to proceed with their companies. When troops arrive at a wholesome source of water, the hospital corps should fill their canteens for the use of the sick. When the troops are bivouacked, the hospital corps should be employed in throwing up huts, or in establishing temporary hospitals in any adjoining buildings, and in preparing some light food for the sick they have brought in. As the independence of this body is indispensable, a commissariat should be specially attached to it, to issue the necessary supplies, both to the corps, and the sick and wounded under their care. When troops are marching near the enemy, the spring and store waggons should move at some distance in the rear: the long cars, with the hospital corps and their bearers, should keep close in the rear of their respective brigades, to afford immediate relief when necessary.

Every regiment is allowed a bât horse or mule to carry medicines, materials, and instruments. The panniers hitherto used for this purpose are, in every respect, most objectionable. They are made of osier work, and are unwieldy, liable to be bulged in when coming in contact with other baggage, easily penetrated by rain, or injured in fording deep rivers or streams, the covering skins not protecting sufficiently the pervious baskets—they are also much too large: a very small proportion of medicine is requisite in the field, and these cases should, therefore, principally contain surgical materials. Light leather waterproof cases are preferable, as they can be slung on an orderly's back, when rapid movements off the roads prevent bât horses from keeping up; they should besides be made to open in such a manner as to bring their contents into view, to obviate the necessity of unpacking and deranging. It would be desirable that surgical saddles, on the plan of those proposed by M. Weiss, should be adopted by regimental surgeons, as they contain all the instruments, materials, and medicines, that could possibly be required in the field, by which means bât horses might be kept in the rear, and not encumber the line of march, an evil that should be guarded against, as much as possible, in military operations.

In addition to these, the assistant surgeons should carry a small leather haversack, with a cover buttoning down to contain their pocket instruments, several pairs of locking or torsion forceps, a few light dressings, pins, sponges, &c. &c. The hospital sergeant should be equipped with a larger leathern haversack for additional dressings, sponges, tourniquets, wax candles, and the means of striking a light. Incalculable difficulties and serious accidents are frequently encountered from neglect in carrying wax candles and lanthorns. This extensive distribution in small quantities of surgical materials and medicines will greatly tend to diminish transport, and render them more available in the assistance of the sick and wounded. Nothing can surpass the distress a surgeon experiences in action, when the bât horses have been delayed in the rear; medical officers should therefore be independent of this casualty, and always have with them dressings for at least 100 or 150 cases; the lint, rollers, and adhesive plaster required for that number would be of very trifling weight when thus divided. It will appear by this arrangement that the portable material will be in the first line, the light carriages in the second, and the heavier conveyances in reserve. In surgical equipments great attention should be paid to the fracture splints, which should be of sufficient solidity to protect the limb from the jolting which the wounded must more or less experience on bad roads. Stump pillows, made of the patent India rubber, to be inflated when required, should also be provided, as they will be found of the greatest utility and comfort in cases of amputation. Every experienced surgeon must have frequently wished for such an invaluable aid when obliged to prop the sufferer's limb with stones, knapsacks, or any other support they can find at hand. The perfect manner in which this cloth is now prepared by the patentee, and the variety of uses for which it is daily made available, recommend it strongly for many important applications in the field, such as tents, beds, pillows, seats, over-all coats, water skins, &c.; but the screw-stopper, for inflating the beds, pillows, and seats, should be of a simpler and better construction than that in present use.

*Duties of Medical Officers and the Ambulance or Hospital Corps in action.*—If zeal, talent, and industry are requisite qualities of a medical man in camps and quarters, it is more especially when contending armies meet that all his energies should be collected. While warlike preparations occupy the military leaders, the army-surgeon, calm amidst the surrounding storm, must be ready to meet with fortitude and deliberation the contingencies of war, and assist with promptitude and with vigour the victims of the conflict. He cannot at this anxious moment expect that military chiefs can bestow a thought upon his duties, or regulate his arrangements; he alone stands answerable to his country, that her wounded soldiers are assisted with diligence and attended with care. Medical assistance in battle should be divided into three lines; 1. In the rear of each brigade and within range of musketry, but protected as far as possible by any favourable feature of the country, or buildings, there should be stationed a portion of the hospital corps with the bearers and their canteens filled with water. These men should be placed under the direction of a regimental assistant-surgeon, who will not delay the wounded, but merely apply indispensable dressings and accelerate their speedy removal to the second line. For this purpose the bearers should form a chain of posts along the entire rear of the line, and according to the proposed distribution, a brigade of three thousand men would be assisted by sixty men of the corps with thirty bearers; each post of the chain should then consist of ten men and a corporal; the spare drummers and pioneers would lend additional aid, and on no account whatever should drummers, musicians, or others, non-combatants, be left in charge of their officers' horses; proper bâtmen, or servants, should be attached for that service. In the second line, out of range of musketry, should be established the brigade field-hospital, distinguished by a large camp colour. Here should be found the regimental surgeons, with their assistants, together with the spring-waggons and cars; at this post the wounded must be dressed, cases requiring immediate operations attended to, the wounded placed upon the spring-waggons, or cars, and hence, the bearers, having deposited the wounded, should be sent back to the first line.

In the rear of the centre of each division will be formed the divisional field-hospital, which, if possible, should be out of the range of artillery; this post should be attended by the staff-surgeons of brigades and their assistants, and here operations will be performed, and the wounded assembled to be sent still further to the rear, by the reserve conveyance, or such additional means of transport as the commissariat of the army may procure; for the spring-waggons and cars belonging to the ambulance should immediately return to the second line of assistance. At this third or divisional post the store-waggons will be unloaded, tents pitched if necessary, the folding stretchers for operation put up, and weak broth and spirits and water prepared for the wounded.

The principal medical officer in the field, with the commanding officer of the hospital corps, should be held responsible for the regularity of the service in these three lines of assistance,—replacing from the second line to the first and from the third to the second any casualties amongst the medical officers that may occur during the action. In the establishment of field-hospitals the quartermaster-general should be consulted, that they may not be formed on points likely to be drawn into the circle of operation. The strictest orders should be given to prevent medical officers of regiments from proceeding to the rear with their commanding officers when wounded, an abuse which has too frequently prevailed. While these arrangements are made in the field, evacuating hospitals should be formed in the towns or villages in the rear of the army, where the wounded can be accommodated, and where bedding may be procured from the inhabitants, and means of transport impressed. When the army advances, the first and second lines of medical assistance should also move forwards. On the other hand, when a retreat is commanded, the first and second lines should fall back on the rear, but without precipitation or confusion. If a sudden occurrence should force the troops to abandon their position, the medical officers of the first and second line, with the hospital corps, should immediately fall back on the third or divisional hospital, where no great accumulation of wounded should be found, as from the very commencement of the action, precautions had been taken that the wounded should gradually, but rapidly be sent to the rear. How desirable it would be in these moments of unavoidable confusion, that the surgeons of European armies should wear a distinguishing mark for their protection,—a plume, or aigrette of black horse-hair, which could be worn in all weathers, would be the most easily recognised, and by mutual accord respected.

A victorious army either moves on to further operations or halts upon the field of battle. In the first case, regimental surgeons should proceed with their corps, and the brigade medical staff follow, when the wounded are sent to the rear, the third line would be reinforced with surgeons from the general medical staff. When our troops remain upon the field, and the enemy have fallen back, the medical officers of the second post should proceed to the front of the line of battle with spring-waggons and cars to collect the wounded that may have been left by the skirmishers. As this operation would most probably be conducted during the night, a few torches should be carried by the hospital corps, to facilitate this important and humane search, which is too frequently neglected. Should the fortune of war have compelled us to retreat, the third line should dispatch to the rear every case for which they can find transport, lest any of the waggons should fall into the enemy's hands; all the cases that cannot be removed should then be collected in houses, or if none are on the spot, in fields off the high road, that they may not be exposed to the ill usage of the light troops of the enemy sent in pursuit. The spot where the wounded are thus collected should be distinguished by a large black flag, and a staff-surgeon, with sufficient assistants, left with them.

In future wars it is to be hoped that feelings of humanity will induce belligerent powers not to consider army-surgeons left with the wounded as prisoners. On these painful occasions, sufficient dressings should be also left, as we cannot depend upon the medical stores of the enemy, which may be exhausted, or of an inferior quality. When surgeons are thus placed on duty with an enemy, they must bear in mind that the welfare of our wounded will in a great degree depend upon the propriety of their conduct. No irritation of mind from disappointment, no national feeling should induce them to enter into unpleasant discussions. They should especially endeavour to cultivate a friendly intercourse with their medical brethren, carefully avoiding altercations on professional points, in which most probably they may differ. A deviation from this prudential course has often proved the source of jealousies and animosities, from which the wounded ultimately suffered. When the enemy's wounded are numerous, and their surgeons are not in sufficient numbers to attend to them, we should invariably volunteer our assistance should our own duties afford us leisure. Such a line of conduct is ever appreciated, and cannot fail to lead to ultimate reciprocal advantages and good feeling.

Napoleon, in the North of Spain, having accidentally seen one of our assistants[1], dressing some of his wounded, immediately ordered one hundred Napoleons to be sent to him, with a passport to proceed to Paris, accompanied with a letter recommending him to the minister of war, whom he directed to give him a free admission to the hospitals and schools of the French capital.

In cases where the wounded of the enemy fall into our hands, we should be careful to keep them as much as possible separate from our own, and surgeons understanding their language should be preferred in the selection of their medical attendants. These wounded men should be collected on a given spot, made known to the enemy by a flag of truce, that they may send conveyance for them, and thus relieve our own means of transport, seldom sufficient for all casualties. In night attacks the difficulty of collecting and attending the wounded is incredible, as in these operations, which are usually *coups de main*, the darkest nights are selected. Fires to point out the stations of the surgeons would be desirable, were they not incompatible with military prudence. Torches and lanthorns should, therefore, be put up at every medical point to direct the bearers. The position once carried, fires may then be kindled wherever the wounded are assembled. By the foregoing distribution of medical men and the hospital corps, allowing to each regimental and staff-surgeon two assistants, an army of thirty thousand, which we shall suppose formed of six divisions, twelve brigades, and forty batallions, would be attended, in the first line of succour, by twelve assistants and three hundred bearers; forty surgeons, and sixty-eight assistants with twenty-four spring-waggons and forty long cars on the second line; and by twelve staff-surgeons and twenty-four assistants on the third.

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[1] The late surgeon Brown of the 50th regiment. The emperor would not liberate him, on the plea that we had been the first to consider army-surgeons as prisoners of war.

The expense of such a corps might be adduced as an objection to its formation, but it would not cost the state more than a battalion of eight hundred men and a squadron of one hundred and fifty horse; and when we reflect on the invaluable services they would render our suffering soldiers, distant from friends and home, and exposed to the accumulated miseries of war, the strictest economist would cheerfully sanction a much greater expenditure; nor is there a commanding officer in the service who would not hail with satisfaction such an establishment, as it would obviate the necessity of constantly thinning his ranks by detaching orderlies.

*Transport of Sick and Wounded.*—If the hospital corps could prove of such essential service in the field, in the transport of the sick and wounded to the rear, their assistance would again present incalculable advantages. On this duty they would not only act as orderlies to attend their charge, but would serve as an escort to the convoy; since every private of the corps would be armed with a light carbine.

For the purpose of moving the sick and wounded of an army, we have three means of transport;—1. The conveyance belonging to the hospital corps; 2. The transport of the commissariat, rendered disposable by consumption; 3. Transport belonging to the inhabitants, and impressed for the service. We can only depend upon the first mode of conveyance, but every exertion should be made to obtain the other means of transport.

Officers of the commissariat should invariably be directed to give timely information to the principal medical officers of corps of the time of the departure of their return-transports to the rear for supplies; by this means regiments would gradually be disencumbered of their chronic cases, which by accumulation would materially impede the service, when operations in the front commence. These conveyances should be divided into classes. For instance, waggons, wains, or cars, &c., drawn by horses, mules, or oxen; the number of men each can carry; horses, mules, dromedaries, asses, &c., according to the greater ease and comfort these several descriptions of conveyance may afford: the sick and wounded should be selected and classed.

When water carriage can be found, it should be ascertained whether the boats are decked or open, or capable of being protected by an awning, that the sick may be embarked according to the nature of their ailments. When the sick and wounded are evacuated on the rear, to facilitate these operations, chains of communication should be established between the army and the general hospitals that are to receive them: each station or halting-place to be provided with a small detachment of the hospital corps, with a few spring-waggons and cars, assisted by the occasional passage of disposable commissariat transports, by which means the army would be imperceptibly relieved of their encumbrance without trespassing heavily on the other means of transport. When the inhabitants have fled from their dwellings, which most probably will be found plundered, a small supply of hospital equipments should be issued at every halting-place; but care should be taken that the sick and wounded soldier leaves his corps with his blanket, great-coat, canteen, &c. At every halt a *rendezvous* should be fixed upon for the transport and the sick to assemble the following morning. But when the sick are scattered about a large town, in distant quarters, as every individual concerned cannot exactly know the hour, if there is artillery in the place a gun should be fired half an hour before the time of departure, that the hospital corps, drivers, guides, &c. may repair in time to the assembly-ground.

When transport is impressed, it would be desirable, when practicable, that each communicating station should have a relief of conveyance, by which means the peasantry could return to their homes. When this unfortunately cannot be the case, the peasants will very frequently steal away their cattle during the night. Under such circumstances, the local authorities should be required to replace instantly the draught-horses or oxen withdrawn; this will induce the people of every village to assist in watching the impressed cattle of their neighbours. It is impossible to impress too deeply upon the minds of all those who are in charge of convoys of sick and wounded, the absolute necessity of treating with kindness and humanity the unfortunate peasantry torn from their home and agricultural pursuits for the transport of our sick; when possible, the drivers should be paid at the end of every journey; at all events, their services should be remunerated at a reasonable distance from their abodes, and not by cheques on distant chests, which only become objects of a most disgraceful speculation, as their holder, unable to travel several hundred miles for his wages, will sell his orders, at a sad discount, to the vampyres who follow armies. When the days are short, the hospital corps should be provided with torches. Straggling on the line of march should be carefully avoided, and the head of the convoy should be halted to bring up the rear, when from any circumstances the continuity of the column has been broken up. Wheel conveyance should invariably move in the rear, and the slowest transport lead.

*During a Siege* the hospital corps and ambulance is also of great service; a certain proportion of men with their bearers should be stationed on such points of the parallels as the engineers may consider the safest from the fire of the town. Appointing medical officers to the trenches is a useless precaution. All the casualties should be transported by hand to a sheltered point, where the field-hospitals are established.

# SUPPLEMENT

TO

# THE ENGLISH BOTANY

Mr. C. E. Sowerby begs to inform the Botanical World, that a continuation of the above will be commenced on the First of May next, and will be continued in Numbers, containing Five Plates each, at intervals of two or three months, so long as subjects can be procured.

Mr. S., wishing to render the English Botany as perfect as possible, proposes to include such naturalized or doubtful species, as well as the native plants of Guernsey and Jersey, as are admitted by English Botanists.

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Lambeth, February, 1837.

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